

Package ‘ssdtools’

September 12, 2025

Title Species Sensitivity Distributions

Version 2.4.0

Description Species sensitivity distributions are cumulative probability distributions which are fitted to toxicity concentrations for different species as described by Posthuma et al.(2001) <isbn:9781566705783>. The ssdtools package uses Maximum Likelihood to fit distributions such as the gamma, log-logistic, log-normal and log-normal log-normal mixture. Multiple distributions can be averaged using Akaike Information Criteria. Confidence intervals on hazard concentrations and proportions are produced by bootstrapping.

License Apache License (== 2.0) | file LICENSE

URL <https://github.com/bcgov/ssdtools>,
<https://bcgov.github.io/ssdtools/>

BugReports <https://github.com/bcgov/ssdtools/issues>

Depends R (>= 4.1)

Imports abind, chk, furr, generics, ggplot2, ggtext, glue, goftest, graphics, grid, lifecycle, parallel, plyr, purrr, Rcpp, rlang, scales, ssddata, stats, stringr, tibble, TMB, universals, utils

Suggests actuar, covr, dplyr, EnvStats, extraDistr, fitdistrplus, grDevices, knitr, latex2exp, magrittr, mle.tools, patchwork, readr, reshape2, rmarkdown, testthat (>= 3.0.0), tidyr, tidyselect, tinytex, VGAM, withr

LinkingTo Rcpp, RcppEigen, TMB

VignetteBuilder knitr

Config/testthat/edition 3

Encoding UTF-8

Language en-US

LazyData true

RoxygenNote 7.3.3.9000

NeedsCompilation yes

Author Joe Thorley [aut, cre] (ORCID: <<https://orcid.org/0000-0002-7683-4592>>),
 Rebecca Fisher [aut],
 David Fox [aut],
 Carl Schwarz [aut],
 Angeline Tillmanns [ctb],
 Seb Dalgarno [ctb] (ORCID: <<https://orcid.org/0000-0002-3658-4517>>),
 Kathleen McTavish [ctb],
 Heather Thompson [ctb],
 Doug Spry [ctb],
 Rick van Dam [ctb],
 Graham Batley [ctb],
 Ali Azizishirazi [ctb],
 Nadine Hussein [ctb] (ORCID: <<https://orcid.org/0000-0003-4470-8361>>),
 Sarah Lyons [ctb] (ORCID: <<https://orcid.org/0000-0002-6745-6796>>),
 Duncan Kennedy [ctb] (ORCID: <<https://orcid.org/0009-0001-4880-5751>>),
 Stephanie Hazlitt [ctb],
 Hadley Wickham [ctb],
 Sergio Ibarra Espinosa [ctb],
 Andy Teucher [ctb],
 Emilie Doussantousse [ctb],
 Nan-Hung Hsieh [ctb],
 Florencia D'Andrea [ctb],
 Eduard Szöcs [ctb] (ORCID: <<https://orcid.org/0000-0001-5376-1194>>),
 Province of British Columbia [fnd, cph],
 Environment and Climate Change Canada [fnd, cph],
 Australian Government Department of Climate Change, Energy, the
 Environment and Water [fnd, cph]

Maintainer Joe Thorley <joe@poissonconsulting.ca>

Repository CRAN

Date/Publication 2025-09-12 05:30:02 UTC

Contents

augment.fitdists	3
autoplot.fitdists	4
coef.fitdists	5
estimates.fitdists	5
geom_hcintersect	6
geom_ssdpoint	8
geom_ssdsegment	10
geom_xribbon	12
glance.fitdists	14
is.fitdists	15
predict.fitburrrlioz	16
predict.fitdists	17
scale_colour_ssd	18
ssdtools-ggproto	19

ssd_at_boundary	20
ssd_censor_data	21
ssd_computable	22
ssd_data	23
ssd_dists	23
ssd_dists_all	24
ssd_dists_bcanz	25
ssd_dists_shiny	26
ssd_eburrrIII3	26
ssd_ecd	28
ssd_ecd_data	28
ssd_exposure	29
ssd_fit_bcanz	30
ssd_fit_burrrloz	31
ssd_fit_dists	32
ssd_gof	34
ssd_hc	35
ssd_hc_bcanz	38
ssd_hp	39
ssd_hp_bcanz	41
ssd_is_censored	42
ssd_label_comma	43
ssd_label_comma_hc	44
ssd_licensing_md	45
ssd_match_moments	45
ssd_min_pmix	46
ssd_pal	47
ssd_pburrrIII3	47
ssd_plot	52
ssd_plot_cdf	54
ssd_plot_data	55
ssd_qburrrIII3	57
ssd_rburrrIII3	62
ssd_sort_data	67
subset.fitdists	68
tidy.fitdists	69
Index	70

augment.fitdists

*Augmented Data from fitdists Object***Description**

Get a tibble of the original data with augmentation.

Usage

```
## S3 method for class 'fitdists'  
augment(x, ...)
```

Arguments

x	The object.
...	Unused.

Value

A tibble of the augmented data.

See Also

[ssd_data\(\)](#)

Other generics: [glance.fitdists\(\)](#), [tidy.fitdists\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)  
augment(fits)
```

autoplot.fitdists	<i>Plot a fitdists Object</i>
-------------------	-------------------------------

Description

A wrapper on [ssd_plot_cdf\(\)](#).

Usage

```
## S3 method for class 'fitdists'  
autoplot(object, ...)
```

Arguments

object	The object.
...	Unused.

Value

A ggplot object.

See Also

[ssd_plot_cdf\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
autoplot(fits)
```

coef.fitdists	<i>Turn a fitdists Object into a Tidy Tibble</i>
---------------	--

Description

A wrapper on `tidy.fitdists()`.

Usage

```
## S3 method for class 'fitdists'
coef(object, ...)
```

Arguments

object	The object.
...	Unused.

See Also

`tidy.fitdists()`

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
coef(fits)
```

estimates.fitdists	<i>Estimates for fitdists Object</i>
--------------------	--------------------------------------

Description

Gets a named list of the estimated weights and parameters.

Usage

```
## S3 method for class 'fitdists'
estimates(x, all_estimates = FALSE, ...)
```

Arguments

<code>x</code>	The object.
<code>all_estimates</code>	A flag specifying whether to calculate estimates for all implemented distributions.
<code>...</code>	Unused.

Value

A named list of the estimates.

See Also

[tidy.fitdists\(\)](#), [ssd_match_moments\(\)](#), [ssd_hc\(\)](#) and [ssd_plot_cdf\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssdata::ccme_boron)
estimates(fits)
```

geom_hcintersect

Species Sensitivity Hazard Concentration Intersection

Description

Plots the intersection between each xintercept and yintercept value.

Usage

```
geom_hcintersect(
  mapping = NULL,
  data = NULL,
  ...,
  xintercept,
  yintercept,
  na.rm = FALSE,
  show.legend = NA
)
```

Arguments

<code>mapping</code>	Set of aesthetic mappings created by aes() . If specified and <code>inherit.aes = TRUE</code> (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
----------------------	---

data	The data to be displayed in this layer. There are three options: If <code>NULL</code>, the default, the data is inherited from the plot data as specified in the call to <code>ggplot()</code>. A <code>data.frame</code>, or other object, will override the plot data. All objects will be fortified to produce a data frame. See <code>fortify()</code> for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code>, and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).
...	Other arguments passed on to <code>layer()</code>'s <code>params</code> argument. These arguments broadly fall into one of 4 categories below. Notably, further arguments to the <code>position</code> argument, or aesthetics that are required can <i>not</i> be passed through ... Unknown arguments that are not part of the 4 categories below are ignored. • Static aesthetics that are not mapped to a scale, but are at a fixed value and apply to the layer as a whole. For example, <code>colour = "red"</code> or <code>linewidth = 3</code>. The geom's documentation has an Aesthetics section that lists the available options. The 'required' aesthetics cannot be passed on to the <code>params</code>. Please note that while passing unmapped aesthetics as vectors is technically possible, the order and required length is not guaranteed to be parallel to the input data. • When constructing a layer using a <code>stat_*()</code> function, the ... argument can be used to pass on parameters to the geom part of the layer. An example of this is <code>stat_density(geom = "area", outline.type = "both")</code>. The geom's documentation lists which parameters it can accept. • Inversely, when constructing a layer using a <code>geom_*()</code> function, the ... argument can be used to pass on parameters to the <code>stat</code> part of the layer. An example of this is <code>geom_area(stat = "density", adjust = 0.5)</code>. The <code>stat</code>'s documentation lists which parameters it can accept. • The <code>key_glyph</code> argument of <code>layer()</code> may also be passed on through ... This can be one of the functions described as key glyphs, to change the display of the layer in the legend.
xintercept	The x-value for the intersect.
yintercept	The y-value for the intersect.
na.rm	If <code>FALSE</code> , the default, missing values are removed with a warning. If <code>TRUE</code> , missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes. It can also be a named logical vector to finely select the aesthetics to display.

See Also

[ssd_plot_cdf\(\)](#)

Other ggplot: [geom_ssdpoint\(\)](#), [geom_ssdsegment\(\)](#), [geom_xribbon\(\)](#), [scale_colour_ssd\(\)](#), [ssd_pal\(\)](#)

Examples

```
ggplot2::ggplot(ssddata::ccme_boron, ggplot2::aes(x = Conc)) +
  geom_ssdpoint() +
  geom_hcintercept(xintercept = 1.5, yintercept = 0.05)
```

geom_ssdpoint	<i>Species Sensitivity Data Points</i>
---------------	--

Description

Uses the empirical cumulative distribution to create scatterplot of points x .

Usage

```
geom_ssdpoint(
  mapping = NULL,
  data = NULL,
  stat = "ssdpoint",
  position = "identity",
  ...,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

- | | |
|---------|---|
| mapping | Set of aesthetic mappings created by aes() . If specified and <code>inherit.aes = TRUE</code> (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping. |
| data | <p>The data to be displayed in this layer. There are three options:</p> <p>If <code>NULL</code>, the default, the data is inherited from the plot data as specified in the call to ggplot().</p> <p>A <code>data.frame</code>, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created.</p> <p>A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code>, and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).</p> |
| stat | <p>The statistical transformation to use on the data for this layer. When using a <code>geom_*()</code> function to construct a layer, the <code>stat</code> argument can be used to override the default coupling between geoms and stats. The <code>stat</code> argument accepts the following:</p> <ul style="list-style-type: none"> • A <code>Stat</code> gproto subclass, for example <code>StatCount</code>. |

	• A string naming the stat. To give the stat as a string, strip the function name of the <code>stat_</code> prefix. For example, to use <code>stat_count()</code>, give the stat as "count". • For more information and other ways to specify the stat, see the layer stat documentation.
position	A position adjustment to use on the data for this layer. This can be used in various ways, including to prevent overplotting and improving the display. The <code>position</code> argument accepts the following: • The result of calling a position function, such as <code>position_jitter()</code>. This method allows for passing extra arguments to the position. • A string naming the position adjustment. To give the position as a string, strip the function name of the <code>position_</code> prefix. For example, to use <code>position_jitter()</code>, give the position as "jitter". • For more information and other ways to specify the position, see the layer position documentation.
...	Other arguments passed on to <code>layer()</code>'s <code>params</code> argument. These arguments broadly fall into one of 4 categories below. Notably, further arguments to the <code>position</code> argument, or aesthetics that are required can <i>not</i> be passed through ... Unknown arguments that are not part of the 4 categories below are ignored. • Static aesthetics that are not mapped to a scale, but are at a fixed value and apply to the layer as a whole. For example, <code>colour = "red"</code> or <code>linewidth = 3</code>. The geom's documentation has an Aesthetics section that lists the available options. The 'required' aesthetics cannot be passed on to the <code>params</code>. Please note that while passing unmapped aesthetics as vectors is technically possible, the order and required length is not guaranteed to be parallel to the input data. • When constructing a layer using a <code>stat_*()</code> function, the ... argument can be used to pass on parameters to the geom part of the layer. An example of this is <code>stat_density(geom = "area", outline.type = "both")</code>. The geom's documentation lists which parameters it can accept. • Inversely, when constructing a layer using a <code>geom_*()</code> function, the ... argument can be used to pass on parameters to the stat part of the layer. An example of this is <code>geom_area(stat = "density", adjust = 0.5)</code>. The stat's documentation lists which parameters it can accept. • The <code>key_glyph</code> argument of <code>layer()</code> may also be passed on through ... This can be one of the functions described as key glyphs, to change the display of the layer in the legend.
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. <code>borders()</code> .

See Also

[ssd_plot_cdf\(\)](#)

Other ggplot: [geom_hcintersect\(\)](#), [geom_ssdsegment\(\)](#), [geom_xribbon\(\)](#), [scale_colour_ssd\(\)](#), [ssd_pal\(\)](#)

Examples

```
ggplot2::ggplot(ssddata::ccme_boron, ggplot2::aes(x = Conc)) +
  geom_ssdpoint()
```

geom_ssdsegment

Species Sensitivity Censored Segments

Description

Uses the empirical cumulative distribution to draw lines between points x and xend.

Usage

```
geom_ssdsegment(
  mapping = NULL,
  data = NULL,
  stat = "ssdsegment",
  position = "identity",
  ...,
  arrow = NULL,
  arrow.fill = NULL,
  lineend = "butt",
  linejoin = "round",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by aes() . If specified and inherit.aes = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If NULL, the default, the data is inherited from the plot data as specified in the call to ggplot(). A data.frame, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created.

	A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code>, and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).
stat	The statistical transformation to use on the data for this layer. When using a <code>geom_*()</code> function to construct a layer, the <code>stat</code> argument can be used to override the default coupling between geoms and stats. The <code>stat</code> argument accepts the following: • A Stat ggproto subclass, for example <code>StatCount</code>. • A string naming the stat. To give the stat as a string, strip the function name of the <code>stat_</code> prefix. For example, to use <code>stat_count()</code>, give the stat as "count". • For more information and other ways to specify the stat, see the layer stat documentation.
position	A position adjustment to use on the data for this layer. This can be used in various ways, including to prevent overplotting and improving the display. The <code>position</code> argument accepts the following: • The result of calling a position function, such as <code>position_jitter()</code>. This method allows for passing extra arguments to the position. • A string naming the position adjustment. To give the position as a string, strip the function name of the <code>position_</code> prefix. For example, to use <code>position_jitter()</code>, give the position as "jitter". • For more information and other ways to specify the position, see the layer position documentation.
...	Other arguments passed on to <code>layer()</code>'s <code>params</code> argument. These arguments broadly fall into one of 4 categories below. Notably, further arguments to the <code>position</code> argument, or aesthetics that are required can <i>not</i> be passed through Unknown arguments that are not part of the 4 categories below are ignored. • Static aesthetics that are not mapped to a scale, but are at a fixed value and apply to the layer as a whole. For example, <code>colour = "red"</code> or <code>linewidth = 3</code>. The geom's documentation has an Aesthetics section that lists the available options. The 'required' aesthetics cannot be passed on to the <code>params</code>. Please note that while passing unmapped aesthetics as vectors is technically possible, the order and required length is not guaranteed to be parallel to the input data. • When constructing a layer using a <code>stat_*()</code> function, the ... argument can be used to pass on parameters to the geom part of the layer. An example of this is <code>stat_density(geom = "area", outline.type = "both")</code>. The geom's documentation lists which parameters it can accept. • Inversely, when constructing a layer using a <code>geom_*()</code> function, the ... argument can be used to pass on parameters to the stat part of the layer. An example of this is <code>geom_area(stat = "density", adjust = 0.5)</code>. The stat's documentation lists which parameters it can accept. • The <code>key_glyph</code> argument of <code>layer()</code> may also be passed on through This can be one of the functions described as key glyphs, to change the display of the layer in the legend.
arrow	specification for arrow heads, as created by <code>grid::arrow()</code>.

arrow.fill	fill colour to use for the arrow head (if closed). NULL means use colour aesthetic.
lineend	Line end style (round, butt, square).
linejoin	Line join style (round, mitre, bevel).
na.rm	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. <code>borders()</code> .

See Also

[ssd_plot_cdf\(\)](#)

Other ggplot: [geom_hcintersect\(\)](#), [geom_ssdpoint\(\)](#), [geom_xribbon\(\)](#), [scale_colour_ssd\(\)](#), [ssd_pal\(\)](#)

Examples

```
ggplot2::ggplot(ssddata::ccme_boron, ggplot2::aes(x = Conc, xend = Conc * 2)) +
  geom_ssdsegment()
```

geom_xribbon

Ribbon on X-Axis

Description

Plots the x interval defined by xmin and xmax.

Usage

```
geom_xribbon(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  ...,
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE
)
```

Arguments

mapping	Set of aesthetic mappings created by aes() . If specified and <code>inherit.aes = TRUE</code> (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	The data to be displayed in this layer. There are three options: If <code>NULL</code>, the default, the data is inherited from the plot data as specified in the call to ggplot(). A <code>data.frame</code>, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created. A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code>, and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).
stat	The statistical transformation to use on the data for this layer. When using a <code>geom_*()</code> function to construct a layer, the <code>stat</code> argument can be used to override the default coupling between geoms and stats. The <code>stat</code> argument accepts the following: • A Stat ggproto subclass, for example <code>StatCount</code>. • A string naming the stat. To give the stat as a string, strip the function name of the <code>stat_</code> prefix. For example, to use <code>stat_count()</code>, give the stat as <code>"count"</code>. • For more information and other ways to specify the stat, see the layer stat documentation.
position	A position adjustment to use on the data for this layer. This can be used in various ways, including to prevent overplotting and improving the display. The <code>position</code> argument accepts the following: • The result of calling a position function, such as <code>position_jitter()</code>. This method allows for passing extra arguments to the position. • A string naming the position adjustment. To give the position as a string, strip the function name of the <code>position_</code> prefix. For example, to use <code>position_jitter()</code>, give the position as <code>"jitter"</code>. • For more information and other ways to specify the position, see the layer position documentation.
...	Other arguments passed on to layer()'s <code>params</code> argument. These arguments broadly fall into one of 4 categories below. Notably, further arguments to the <code>position</code> argument, or aesthetics that are required can <i>not</i> be passed through Unknown arguments that are not part of the 4 categories below are ignored. • Static aesthetics that are not mapped to a scale, but are at a fixed value and apply to the layer as a whole. For example, <code>colour = "red"</code> or <code>linewidth = 3</code>. The geom's documentation has an Aesthetics section that lists the available options. The 'required' aesthetics cannot be passed on to the <code>params</code>. Please note that while passing unmapped aesthetics as vectors is technically possible, the order and required length is not guaranteed to be parallel to the input data.

- When constructing a layer using a `stat_*`() function, the `...` argument can be used to pass on parameters to the `geom` part of the layer. An example of this is `stat_density(geom = "area", outline.type = "both")`. The `geom`'s documentation lists which parameters it can accept.
- Inversely, when constructing a layer using a `geom_*`() function, the `...` argument can be used to pass on parameters to the `stat` part of the layer. An example of this is `geom_area(stat = "density", adjust = 0.5)`. The `stat`'s documentation lists which parameters it can accept.
- The `key_glyph` argument of `layer()` may also be passed on through `...`. This can be one of the functions described as [key glyphs](#), to change the display of the layer in the legend.

<code>na.rm</code>	If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.
<code>show.legend</code>	logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.
<code>inherit.aes</code>	If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. <code>borders()</code> .

See Also

[ssd_plot_cdf\(\)](#)

Other ggplot: [geom_hcintersect\(\)](#), [geom_ssdpoin\(\)](#), [geom_sssegment\(\)](#), [scale_colour_ssd\(\)](#), [ssd_pal\(\)](#)

Examples

```
gp <- ggplot2::ggplot(boron_pred) +
  geom_xribbon(ggplot2::aes(xmin = lcl, xmax = ucl, y = proportion))
```

<code>glance.fitdists</code>	<i>Get a tibble summarizing each distribution</i>
------------------------------	---

Description

Gets a tibble with a single row for each distribution.

Usage

```
## S3 method for class 'fitdists'
glance(x, ..., wt = FALSE)
```

Arguments

x	The object.
...	Unused.
wt	A flag specifying whether to return the Akaike weight as "wt" instead of "weight".

Value

A tidy tibble of the distributions.

See Also

[ssd_gof\(\)](#)

Other generics: [augment.fitdists\(\)](#), [tidy.fitdists\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssdata::ccme_boron)
glance(fits, wt = TRUE)
```

is.fitdists

Is fitdists Object

Description

Tests whether x is a fitdists Object.

Usage

```
is.fitdists(x)
```

Arguments

x	The object.
---	-------------

Value

A flag specifying whether x is a fitdists Object.

Examples

```
fits <- ssd_fit_dists(ssdata::ccme_boron)
is.fitdists(fits)
```

predict.fitburrrlioz *Predict Hazard Concentrations of fitburrrlioz Object*

Description

A wrapper on [ssd_hc\(\)](#) that by default calculates all hazard concentrations from 1 to 99%.

Usage

```
## S3 method for class 'fitburrrlioz'
predict(
  object,
  percent,
  proportion = 1:99/100,
  ...,
  ci = FALSE,
  level = 0.95,
  nboot = 1000,
  min_pboot = 0.95,
  parametric = TRUE
)
```

Arguments

object	The object.
percent	A numeric vector of percent values to estimate hazard concentrations for. Deprecated for proportion = 0.05. [Deprecated]
proportion	A numeric vector of proportion values to estimate hazard concentrations for.
...	Unused.
ci	A flag specifying whether to estimate confidence intervals (by bootstrapping).
level	A number between 0 and 1 of the confidence level of the interval.
nboot	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.
min_pboot	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.
parametric	A flag specifying whether to perform parametric bootstrapping as opposed to non-parametrically resampling the original data with replacement.

Details

It is useful for plotting purposes.

See Also

[ssd_hc\(\)](#) and [ssd_plot\(\)](#)

Examples

```
fits <- ssd_fit_burrlioz(ssddata::ccme_boron)
predict(fits)
```

predict.fitdists	<i>Predict Hazard Concentrations of fitdists Object</i>
------------------	---

Description

A wrapper on [ssd_hc\(\)](#) that by default calculates all hazard concentrations from 1 to 99%.

Usage

```
## S3 method for class 'fitdists'
predict(
  object,
  percent,
  proportion = 1:99/100,
  ...,
  average = TRUE,
  ci = FALSE,
  level = 0.95,
  nboot = 1000,
  min_pboot = 0.95,
  est_method = "multi",
  ci_method = "weighted_samples",
  parametric = TRUE,
  delta = 9.21,
  control = NULL
)
```

Arguments

object	The object.
percent	A numeric vector of percent values to estimate hazard concentrations for. Deprecated for proportion = 0.05. [Deprecated]
proportion	A numeric vector of proportion values to estimate hazard concentrations for.
...	Unused.
average	A flag specifying whether to provide model averaged values as opposed to a value for each distribution.
ci	A flag specifying whether to estimate confidence intervals (by bootstrapping).
level	A number between 0 and 1 of the confidence level of the interval.
nboot	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.

min_pboot	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.
est_method	A string specifying whether to estimate directly from the model-averaged cumulative distribution function (<code>est_method = 'multi'</code>) or to take the arithmetic mean of the estimates from the individual cumulative distribution functions weighted by the AICc derived weights (<code>est_method = 'arithmetic'</code>) or to use the geometric mean instead (<code>est_method = 'geometric'</code>).
ci_method	A string specifying which method to use for estimating the standard error and confidence limits from the bootstrap samples. Possible values include <code>ci_method = "multi_fixed"</code> and <code>ci_method = "multi_free"</code> which generate the bootstrap samples using the model-averaged cumulative distribution function but differ in whether the model weights are fixed at the values for the original dataset or re-estimated for each bootstrap sample dataset. The value <code>ci_method = "weighted_samples"</code> takes bootstrap samples from each distribution proportional to its AICc based weights and calculates the confidence limits (and SE) from this single set. The value <code>ci_method = "MACL"</code> (was <code>ci_method = "weighted_arithmetic"</code> but has been soft-deprecated) which is only included for historical reasons takes the weighted arithmetic mean of the confidence limits.
parametric	A flag specifying whether to perform parametric bootstrapping as opposed to non-parametrically resampling the original data with replacement.
delta	A non-negative number specifying the maximum absolute AIC difference cutoff. Distributions with an absolute AIC difference greater than delta are excluded from the calculations.
control	A list of control parameters passed to <code>stats::optim()</code> .

Details

It is useful for plotting purposes.

See Also

[ssd_hc\(\)](#) and [ssd_plot\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssdata::ccme_boron)
predict(fits)
```

scale_colour_ssd

Discrete color-blind scale for SSD Plots

Description

The functions were designed for coloring different groups in a plot of SSD data.

Usage

```
scale_colour_ssd(...)

scale_color_ssd(...)

scale_fill_ssd(...)
```

Arguments

... Arguments passed to `ggplot2::discrete_scale()`.

Functions

- `scale_color_ssd()`: Discrete color-blind scale for SSD Plots
- `scale_fill_ssd()`: Discrete color-blind scale for SSD Plots

See Also

Other ggplot: `geom_hcintersect()`, `geom_ssdpoint()`, `geom_ssdsegment()`, `geom_xribbon()`, `ssd_pal()`

Examples

```
# Use the color-blind palette for a SSD plot
ssd_plot(ssddata::ccme_boron, boron_pred, shape = "Group", color = "Group") +
  scale_colour_ssd()
# Use the color-blind palette for a histogram of concentrations
ggplot2::ggplot(ssddata::ccme_boron, ggplot2::aes(x = Species, y = Conc, fill = Group)) +
  ggplot2::geom_col() +
  scale_fill_ssd() +
  ggplot2::theme(axis.text.x = ggplot2::element_text(angle = 90, vjust = 0.5, hjust = 1))
```

ssdtools-ggproto

ggproto Classes for Plotting Species Sensitivity Data and Distributions

Description

ggproto Classes for Plotting Species Sensitivity Data and Distributions

Usage

```
StatSsdpoint

StatSsdsegment

GeomSsdpoint
```

GeomSsdsegment

GeomHcintersect

GeomXribbon

Format

An object of class StatSsdpoint (inherits from Stat, ggproto, gg) of length 4.

An object of class StatSsdsegment (inherits from Stat, ggproto, gg) of length 4.

An object of class GeomSsdpoint (inherits from GeomPoint, Geom, ggproto, gg) of length 1.

An object of class GeomSsdsegment (inherits from GeomSegment, Geom, ggproto, gg) of length 1.

An object of class GeomHcintersect (inherits from Geom, ggproto, gg) of length 5.

An object of class GeomXribbon (inherits from Geom, ggproto, gg) of length 6.

See Also

[ggplot2::ggproto\(\)](#) and [ssd_plot_cdf\(\)](#)

ssd_at_boundary	<i>Is At Boundary</i>
-----------------	-----------------------

Description

Generic function to test if one or more parameters is at boundary.

Usage

```
ssd_at_boundary(x, ...)

## S3 method for class 'tmbfit'
ssd_at_boundary(x, ...)

## S3 method for class 'fitdists'
ssd_at_boundary(x, ...)
```

Arguments

x	The object.
...	Unused.

Value

A flag for each distribution indicating if one or more parameters at boundary.

A flag indicating if one or more parameters at boundary.

A logical vector for each distribution indicating if one or more parameters at boundary.

Methods (by class)

- `ssd_at_boundary(tmbfit)`: Is At Boundary for tmbfit Object
- `ssd_at_boundary(fitdists)`: Is At Boundary for fitdists Object

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron,
  dists = c("lnorm", "lnorm_lnorm", "burrIII3")
)
ssd_at_boundary(fits$lnorm)
ssd_at_boundary(fits$lnorm_lnorm)
ssd_at_boundary(fits$burrIII3)

fits <- ssd_fit_dists(ssddata::ccme_boron,
  dists = c("lnorm", "lnorm_lnorm", "burrIII3")
)
ssd_at_boundary(fits)
```

ssd_censor_data

*Censor Data***Description**

Censors data to a specified range based on the censoring argument. The function is useful for creating test data sets.

Usage

```
ssd_censor_data(data, left = "Conc", ..., right = left, censoring = c(0, Inf))
```

Arguments

<code>data</code>	A data frame.
<code>left</code>	A string of the column in data with the concentrations.
<code>...</code>	Unused.
<code>right</code>	A string of the column in data with the right concentration values.
<code>censoring</code>	A numeric vector of the left and right censoring values.

Value

A tibble of the censored data.

Examples

```
ssd_censor_data(ssddata::ccme_boron, censoring = c(2.5, Inf))
```

ssd_computable	<i>Is Computable Standard Errors</i>
----------------	--------------------------------------

Description

Generic function to test if all parameters have numerically computable standard errors.

Usage

```
ssd_computable(x, ...)

## S3 method for class 'tmbfit'
ssd_computable(x, ...)

## S3 method for class 'fitdists'
ssd_computable(x, ...)
```

Arguments

x	The object.
...	Unused.

Value

A flag for each distribution indicating if all parameters have numerically computable standard errors.

A flag indicating if all parameters have numerically computable standard errors.

A logical vector for each distribution indicating if all parameters have numerically computable standard errors.

Methods (by class)

- `ssd_computable(tmbfit)`: Is Computable Standard for tmbfit Object
- `ssd_computable(fitdists)`: Is At Boundary for fitdists Object

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron,
  dists = c("lnorm", "lnorm_lnorm", "burrIII3")
)
ssd_computable(fits$lnorm)
ssd_computable(fits$lnorm_lnorm)
ssd_computable(fits$burrIII3)

fits <- ssd_fit_dists(ssddata::ccme_boron,
  dists = c("lnorm", "lnorm_lnorm", "burrIII3")
)
```

```
ssd_computable(fits)
```

ssd_data	<i>Data from fitdists Object</i>
----------	----------------------------------

Description

Get a tibble of the original data.

Usage

```
ssd_data(x)
```

Arguments

x The object.

Value

A tibble of the original data.

See Also

[augment.fitdists\(\)](#), [ssd_ecd_data\(\)](#) and [ssd_sort_data\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_data(fits)
```

ssd_dists	<i>Species Sensitivity Distributions</i>
-----------	--

Description

Gets a character vector of the names of the available distributions.

Usage

```
ssd_dists(bcanz = NULL, ..., tails = NULL, npars = 2:5, valid = TRUE)
```

Arguments

bcanz	A flag or NULL specifying whether to only include distributions in the set that is approved by BC, Canada, Australia and New Zealand for official guidelines.
...	Unused.
tails	A flag or NULL specifying whether to only include distributions with both tails.
npars	A whole numeric vector specifying which distributions to include based on the number of parameters.
valid	A flag or NULL specifying whether to include distributions with valid likelihoods that allows them to be fit with other distributions for modeling averaging.

Value

A unique, sorted character vector of the distributions.

See Also

Other dists: [dist_data](#), [ssd_dists_all\(\)](#), [ssd_dists_shiny\(\)](#)

Examples

```
ssd_dists()
ssd_dists(bcanz = TRUE)
ssd_dists(tails = FALSE)
ssd_dists(npars = 5)
```

ssd_dists_all

All Species Sensitivity Distributions

Description

Gets a character vector of the names of all the available distributions.

Usage

```
ssd_dists_all(valid = TRUE)
```

Arguments

valid	A flag or NULL specifying whether to include distributions with valid likelihoods that allows them to be fit with other distributions for modeling averaging.
-------	---

Value

A unique, sorted character vector of the distributions.

See Also

Other dists: [dist_data](#), [ssd_dists\(\)](#), [ssd_dists_shiny\(\)](#)

Examples

```
ssd_dists_all()
```

ssd_dists_bcanz	<i>BCANZ Distributions</i>
-----------------	----------------------------

Description

Gets a character vector of the names of the distributions adopted by BC, Canada, Australia and New Zealand for official guidelines.

Usage

```
ssd_dists_bcanz(npars = c(2L, 5L))
```

Arguments

npars	A whole numeric vector specifying which distributions to include based on the number of parameters.
-------	---

Value

A unique, sorted character vector of the distributions.

See Also

[ssd_dists\(\)](#)

Examples

```
ssd_dists_bcanz()  
ssd_dists_bcanz(npars = 2)
```

ssd_dists_shiny	<i>All Shiny Species Sensitivity Distributions</i>
-----------------	--

Description

Gets a character vector of the names of all the available distributions in the shinyssdtools.

Usage

```
ssd_dists_shiny()
```

Value

A unique, sorted character vector of the distributions.

See Also

Other dists: [dist_data](#), [ssd_dists\(\)](#), [ssd_dists_all\(\)](#)

Examples

```
ssd_dists_shiny()
```

ssd_eburrrIII3	<i>Default Parameter Estimates</i>
----------------	------------------------------------

Description

Default Parameter Estimates

Usage

```
ssd_eburrrIII3()
```

```
ssd_egamma()
```

```
ssd_egompertz()
```

```
ssd_einvpareto()
```

```
ssd_elgumbel()
```

```
ssd_elgumbel()
```

```
ssd_ellogis_llogis()
```

```
ssd_ellogis()

ssd_elnorm_lnorm()

ssd_elnorm()

ssd_emulti()

ssd_eweibull()
```

Functions

- `ssd_eburrrIII3()`: Default Parameter Values for BurrIII Distribution
- `ssd_egamma()`: Default Parameter Values for Gamma Distribution
- `ssd_egompertz()`: Default Parameter Values for Gompertz Distribution
- `ssd_einvpareto()`: Default Parameter Values for Inverse Pareto Distribution
- `ssd_elgumbel()`: Default Parameter Values for Log-Gumbel Distribution
- `ssd_elgumbel()`: Default Parameter Values for log-Gumbel Distribution
- `ssd_ellogis_llogis()`: Default Parameter Values for Log-Logistic/Log-Logistic Mixture Distribution
- `ssd_ellogis()`: Default Parameter Values for Log-Logistic Distribution
- `ssd_elnorm_lnorm()`: Default Parameter Values for Log-Normal/Log-Normal Mixture Distribution
- `ssd_elnorm()`: Default Parameter Values for Log-Normal Distribution
- `ssd_emulti()`: Default Parameter Values for Multiple Distributions
- `ssd_eweibull()`: Default Parameter Values for Log-Normal Distribution

See Also

[ssd_p](#) and [ssd_q](#)

Examples

```
ssd_eburrrIII3()

ssd_egamma()

ssd_egompertz()

ssd_einvpareto()

ssd_einvpareto()

ssd_elgumbel()

ssd_ellogis_llogis()
```

```
ssd_ellogis()
ssd_elnorm_lnorm()
ssd_elnorm()
ssd_emulti()
ssd_eweibull()
```

ssd_ecd	<i>Empirical Cumulative Density</i>
---------	-------------------------------------

Description

Empirical Cumulative Density

Usage

```
ssd_ecd(x, ties.method = "first")
```

Arguments

- x a numeric, complex, character or logical vector.
- ties.method a character string specifying how ties are treated, see ‘Details’; can be abbreviated.

Value

A numeric vector of the empirical cumulative density.

Examples

```
ssd_ecd(1:10)
```

ssd_ecd_data	<i>Empirical Cumulative Density for Species Sensitivity Data</i>
--------------	--

Description

Empirical Cumulative Density for Species Sensitivity Data

Usage

```
ssd_ecd_data(
  data,
  left = "Conc",
  right = left,
  ...,
  bounds = c(left = 1, right = 1)
)
```

Arguments

<code>data</code>	A data frame.
<code>left</code>	A string of the column in data with the concentrations.
<code>right</code>	A string of the column in data with the right concentration values.
<code>...</code>	Unused.
<code>bounds</code>	A named non-negative numeric vector of the left and right bounds for uncensored missing (0 and Inf) data in terms of the orders of magnitude relative to the extremes for non-missing values.

Value

A numeric vector of the empirical cumulative density for the rows in data.

See Also

[ssd_ecd\(\)](#) and [ssd_data\(\)](#)

Examples

```
ssd_ecd_data(ssddata::ccme_boron)
```

ssd_exposure	<i>Proportion Exposure</i>
--------------	----------------------------

Description

Calculates average proportion exposed based on log-normal distribution of concentrations.

Usage

```
ssd_exposure(x, meanlog = 0, sdlog = 1, ..., nboot = 1000)
```

Arguments

x	The object.
meanlog	The mean of the exposure concentrations on the log scale.
sdlog	The standard deviation of the exposure concentrations on the log scale.
...	Unused.
nboot	The number of samples to use to calculate the exposure.

Value

The proportion exposed.

Examples

```
## Not run:
fits <- ssd_fit_dists(ssddata::ccme_boron, dists = "lnorm")
withr::with_seed(50, {
  ssd_exposure(fits)
  ssd_exposure(fits, meanlog = 1)
  ssd_exposure(fits, meanlog = 1, sdlog = 1)
})

## End(Not run)
```

ssd_fit_bcanz	<i>Fit BCANZ Distributions</i>
---------------	--------------------------------

Description

Fits distributions using settings adopted by BC, Canada, Australia and New Zealand for official guidelines.

Usage

```
ssd_fit_bcanz(data, left = "Conc", ..., dists = ssd_dists_bcanz())
```

Arguments

data	A data frame.
left	A string of the column in data with the concentrations.
...	Unused.
dists	A character vector of the distribution names.

Value

An object of class `fitdists`.

See Also[ssd_fit_dists\(\)](#)Other BCANZ: [ssd_hc_bcanz\(\)](#), [ssd_hp_bcanz\(\)](#)**Examples**

```
ssd_fit_bcanz(ssddata::cme_boron)
```

ssd_fit_burrlioz*Fit Burrlioz Distributions*

Description

Fits 'burrIII3' distribution. If shape1 parameter is at boundary returns 'lgumbel' (which is equivalent to inverse Weibull). Else if shape2 parameter is at a boundary returns 'invpareto'. Otherwise returns 'burrIII3'

Usage

```
ssd_fit_burrlioz(  
  data,  
  left = "Conc",  
  ...,  
  rescale = FALSE,  
  control = list(),  
  silent = FALSE  
)
```

Arguments

data	A data frame.
left	A string of the column in data with the concentrations.
...	Unused.
rescale	A string specifying whether to leave the values unchanged ("no") or to rescale concentration values by dividing by the geometric mean of the minimum and maximum positive finite values ("geomean") or to logistically transform ("odds").
control	A list of control parameters passed to stats::optim() .
silent	A flag indicating whether fits should fail silently.

Value

An object of class `fitdists`.

See Also[ssd_fit_dists\(\)](#)

Examples

```
ssd_fit_burrliaz(ssddata::ccme_boron)
```

ssd_fit_dists

Fit Distributions

Description

Fits one or more distributions to species sensitivity data.

Usage

```
ssd_fit_dists(
  data,
  left = "Conc",
  ...,
  right = left,
  weight = NULL,
  dists = ssd_dists_bcanz(),
  nrow = 6L,
  rescale = FALSE,
  odds_max = 0.999,
  reweight = FALSE,
  computable = FALSE,
  at_boundary_ok = TRUE,
  all_dists = FALSE,
  min_pmix = ssd_min_pmix(nrow(data)),
  range_shape1 = c(0.05, 20),
  range_shape2 = range_shape1,
  control = list(),
  silent = FALSE
)
```

Arguments

data	A data frame.
left	A string of the column in data with the concentrations.
...	Unused.
right	A string of the column in data with the right concentration values.
weight	A string of the numeric column in data with positive weights less than or equal to 1,000 or NULL.
dists	A character vector of the distribution names.
nrow	A positive whole number of the minimum number of non-missing rows.

rescale	A string specifying whether to leave the values unchanged ("no") or to rescale concentration values by dividing by the geometric mean of the minimum and maximum positive finite values ("geomean") or to logistically transform ("odds").
odds_max	A number specifying the upper left value when rescale = "odds". By default left values cannot exceed 0.999.
reweight	A flag specifying whether to reweight weights by dividing by the largest weight.
computable	A flag specifying whether to only return fits with numerically computable standard errors.
at_boundary_ok	A flag specifying whether a model with one or more parameters at the boundary should be considered to have converged (default = FALSE).
all_dists	A flag specifying whether all the named distributions must fit successfully.
min_pmix	A number between 0 and 0.5 specifying the minimum proportion in mixture models.
range_shape1	A numeric vector of length two of the lower and upper bounds for the shape1 parameter.
range_shape2	shape2 parameter.
control	A list of control parameters passed to <code>stats::optim()</code> .
silent	A flag indicating whether fits should fail silently.

Details

By default the 'gamma', 'lgumbel', 'llogis', 'lnorm', 'lnorm_lnorm' and 'weibull' distributions are fitted to the data. For a complete list of the distributions that are currently implemented in `ssdtools` see `ssd_dists_all()`.

If weight specifies a column in the data frame with positive numbers, weighted estimation occurs. However, currently only the resultant parameter estimates are available.

If the right argument is different to the left argument then the data are considered to be censored.

Value

An object of class `fitdists`.

See Also

`ssd_plot_cdf()` and `ssd_hc()`

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
fits
ssd_plot_cdf(fits)
ssd_hc(fits)
```

ssd_gof

*Goodness of Fit***Description**

Returns a tbl data frame with the following columns

dist The distribution name (chr)

aic Akaike's Information Criterion (dbl)

bic Bayesian Information Criterion (dbl)

at_bound Parameter(s) at boundary (lgl)

computable All parameter have computable standard errors (lgl)

and if the data are non-censored

aicc Akaike's Information Criterion corrected for sample size (dbl)

and if there are 8 or more samples

ad Anderson-Darling statistic (dbl)

ks Kolmogorov-Smirnov statistic (dbl)

cvm Cramer-von Mises statistic (dbl)

In the case of an object of class `fitdists` the function also returns

delta The Information Criterion differences (dbl)

wt The Information Criterion weights (dbl)

where `delta` and `wt` are based on `aic` for censored data and `aicc` for non-censored data.

Usage

```
ssd_gof(x, ...)
```

```
## S3 method for class 'fitdists'
```

```
ssd_gof(x, ..., pvalue = FALSE, wt = FALSE)
```

Arguments

`x` The object.

`...` Unused.

`pvalue` A flag specifying whether to return p-values or the statistics (default) for the various tests.

`wt` A flag specifying whether to return the Akaike weight as "wt" instead of "weight".

Value

A tbl data frame of the gof statistics.

Methods (by class)

- `ssd_gof(fitdists)`: Goodness of Fit

See Also

`glance.fitdists()`

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_gof(fits)
ssd_gof(fits, pvalue = TRUE, wt = TRUE)
```

ssd_hc

Hazard Concentrations for Species Sensitivity Distributions

Description

Calculates concentration(s) with bootstrap confidence intervals that protect specified proportion(s) of species for individual or model-averaged distributions using parametric or non-parametric bootstrapping.

Usage

```
ssd_hc(x, ...)

## S3 method for class 'list'
ssd_hc(x, percent, proportion = 0.05, ...)

## S3 method for class 'fitdists'
ssd_hc(
  x,
  percent = deprecated(),
  proportion = 0.05,
  ...,
  average = TRUE,
  ci = FALSE,
  level = 0.95,
  nboot = 1000,
  min_pboot = 0.95,
  multi_est = deprecated(),
  est_method = "multi",
  ci_method = "weighted_samples",
  parametric = TRUE,
  delta = 9.21,
  samples = FALSE,
  save_to = NULL,
```

```

    control = NULL
)

## S3 method for class 'fitburrlioz'
ssd_hc(
  x,
  percent,
  proportion = 0.05,
  ...,
  ci = FALSE,
  level = 0.95,
  nboot = 1000,
  min_pboot = 0.95,
  parametric = FALSE,
  samples = FALSE,
  save_to = NULL
)

```

Arguments

x	The object.
...	Unused.
percent	A numeric vector of percent values to estimate hazard concentrations for. Deprecated for proportion = 0.05. [Deprecated]
proportion	A numeric vector of proportion values to estimate hazard concentrations for.
average	A flag specifying whether to provide model averaged values as opposed to a value for each distribution.
ci	A flag specifying whether to estimate confidence intervals (by bootstrapping).
level	A number between 0 and 1 of the confidence level of the interval.
nboot	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.
min_pboot	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.
multi_est	A flag specifying whether to estimate directly from the model-averaged cumulative distribution function (multi_est = TRUE) or to take the arithmetic mean of the estimates from the individual cumulative distribution functions weighted by the AICc derived weights (multi_est = FALSE).
est_method	A string specifying whether to estimate directly from the model-averaged cumulative distribution function (est_method = 'multi') or to take the arithmetic mean of the estimates from the individual cumulative distribution functions weighted by the AICc derived weights (est_method = 'arithmetic') or to use the geometric mean instead (est_method = 'geometric').
ci_method	A string specifying which method to use for estimating the standard error and confidence limits from the bootstrap samples. Possible values include ci_method = "multi_fixed" and ci_method = "multi_free" which generate the bootstrap samples using the model-averaged cumulative distribution function but

differ in whether the model weights are fixed at the values for the original dataset or re-estimated for each bootstrap sample dataset. The value `ci_method = "weighted_samples"` takes bootstrap samples from each distribution proportional to its AICc based weights and calculates the confidence limits (and SE) from this single set. The value `ci_method = "MACL"` (was `ci_method = "weighted_arithmetic"` but has been soft-deprecated) which is only included for historical reasons takes the weighted arithmetic mean of the confidence limits.

<code>parametric</code>	A flag specifying whether to perform parametric bootstrapping as opposed to non-parametrically resampling the original data with replacement.
<code>delta</code>	A non-negative number specifying the maximum absolute AIC difference cutoff. Distributions with an absolute AIC difference greater than delta are excluded from the calculations.
<code>samples</code>	A flag specifying whether to include a numeric vector of the bootstrap samples as a list column in the output.
<code>save_to</code>	NULL or a string specifying a directory to save where the bootstrap datasets and parameter estimates (when successfully converged) to.
<code>control</code>	A list of control parameters passed to <code>stats::optim()</code> .

Details

Model-averaged estimates and/or confidence intervals (including standard error) can be calculated by treating the distributions as constituting a single mixture distribution versus 'taking the mean'. When calculating the model averaged estimates treating the distributions as constituting a single mixture distribution ensures that `ssd_hc()` is the inverse of `ssd_hp()`.

Distributions with an absolute AIC difference greater than a delta of by default 7 have considerably less support ($wt < 0.01$) and are excluded prior to calculation of the hazard concentrations to reduce the run time.

Value

A tibble of corresponding hazard concentrations.

Methods (by class)

- `ssd_hc(list)`: Hazard Concentrations for Distributional Estimates
- `ssd_hc(fitdists)`: Hazard Concentrations for fitdists Object
- `ssd_hc(fitburrrlioz)`: Hazard Concentrations for fitburrrlioz Object

References

Burnham, K.P., and Anderson, D.R. 2002. Model Selection and Multimodel Inference. Springer New York, New York, NY. doi:10.1007/b97636.

See Also

`predict.fitdists()` and `ssd_hp()`.

Examples

```
ssd_hc(ssd_match_moments())

fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_hc(fits)

fit <- ssd_fit_burrlioz(ssddata::ccme_boron)
ssd_hc(fit)
```

ssd_hc_bcanz

BCANZ Hazard Concentrations

Description

Gets hazard concentrations with confidence intervals that protect 1, 5, 10 and 20% of species using settings adopted by BC, Canada, Australia and New Zealand for official guidelines. This function can take several minutes to run with recommended 10,000 iterations.

Usage

```
ssd_hc_bcanz(x, ..., nboot = 10000, min_pboot = 0.95)
```

Arguments

x	The object.
...	Unused.
nboot	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.
min_pboot	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.

Value

A tibble of corresponding hazard concentrations.

See Also

[ssd_hc\(\)](#).

Other BCANZ: [ssd_fit_bcanz\(\)](#), [ssd_hp_bcanz\(\)](#)

Examples

```
fits <- ssd_fit_bcanz(ssddata::ccme_boron)
ssd_hc_bcanz(fits, nboot = 100)
```

ssd_hp	<i>Hazard Proportion</i>
--------	--------------------------

Description

Calculates proportion of species affected at specified concentration(s) with quantile based bootstrap confidence intervals for individual or model-averaged distributions using parametric or non-parametric bootstrapping. For more information see the inverse function [ssd_hc\(\)](#).

Usage

```
ssd_hp(x, ...)  
  
## S3 method for class 'fitdists'  
ssd_hp(  
  x,  
  conc = 1,  
  ...,  
  average = TRUE,  
  ci = FALSE,  
  level = 0.95,  
  nboot = 1000,  
  min_pboot = 0.95,  
  multi_est = deprecated(),  
  est_method = "multi",  
  ci_method = "weighted_samples",  
  parametric = TRUE,  
  delta = 9.21,  
  proportion = FALSE,  
  samples = FALSE,  
  save_to = NULL,  
  control = NULL  
)  
  
## S3 method for class 'fitburrrlioz'  
ssd_hp(  
  x,  
  conc = 1,  
  ...,  
  ci = FALSE,  
  level = 0.95,  
  nboot = 1000,  
  min_pboot = 0.95,  
  parametric = FALSE,  
  proportion = FALSE,  
  samples = FALSE,  
  save_to = NULL
```

)

Arguments

<code>x</code>	The object.
<code>...</code>	Unused.
<code>conc</code>	A numeric vector of concentrations to calculate the hazard proportions for.
<code>average</code>	A flag specifying whether to provide model averaged values as opposed to a value for each distribution.
<code>ci</code>	A flag specifying whether to estimate confidence intervals (by bootstrapping).
<code>level</code>	A number between 0 and 1 of the confidence level of the interval.
<code>nboot</code>	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.
<code>min_pboot</code>	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.
<code>multi_est</code>	A flag specifying whether to estimate directly from the model-averaged cumulative distribution function (<code>multi_est = TRUE</code>) or to take the arithmetic mean of the estimates from the individual cumulative distribution functions weighted by the AICc derived weights (<code>multi_est = FALSE</code>).
<code>est_method</code>	A string specifying whether to estimate directly from the model-averaged cumulative distribution function (<code>est_method = 'multi'</code>) or to take the arithmetic mean of the estimates from the individual cumulative distribution functions weighted by the AICc derived weights (<code>est_method = 'arithmetic'</code>) or to use the geometric mean instead (<code>est_method = 'geometric'</code>).
<code>ci_method</code>	A string specifying which method to use for estimating the standard error and confidence limits from the bootstrap samples. Possible values include <code>ci_method = "multi_fixed"</code> and <code>ci_method = "multi_free"</code> which generate the bootstrap samples using the model-averaged cumulative distribution function but differ in whether the model weights are fixed at the values for the original dataset or re-estimated for each bootstrap sample dataset. The value <code>ci_method = "weighted_samples"</code> takes bootstrap samples from each distribution proportional to its AICc based weights and calculates the confidence limits (and SE) from this single set. The value <code>ci_method = "MACL"</code> (was <code>ci_method = "weighted_arithmetic"</code> but has been soft-deprecated) which is only included for historical reasons takes the weighted arithmetic mean of the confidence limits.
<code>parametric</code>	A flag specifying whether to perform parametric bootstrapping as opposed to non-parametrically resampling the original data with replacement.
<code>delta</code>	A non-negative number specifying the maximum absolute AIC difference cutoff. Distributions with an absolute AIC difference greater than delta are excluded from the calculations.
<code>proportion</code>	A flag specifying whether to return hazard proportions (<code>proportion = TRUE</code>) or hazard percentages (<code>proportion = FALSE</code>). To not break existing code the default value is FALSE but will be switching the default to TRUE in a future version. The user is recommended to manually set to TRUE now to avoid unexpected changes in future versions.

samples	A flag specifying whether to include a numeric vector of the bootstrap samples as a list column in the output.
save_to	NULL or a string specifying a directory to save where the bootstrap datasets and parameter estimates (when successfully converged) to.
control	A list of control parameters passed to <code>stats::optim()</code> .

Value

A tibble of corresponding hazard proportions.

Methods (by class)

- `ssd_hp(fitdists)`: Hazard Proportions for `fitdists` Object
- `ssd_hp(fitburrrlioz)`: Hazard Proportions for `fitburrrlioz` Object

See Also

[ssd_hc\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_hp(fits, conc = 1)

fit <- ssd_fit_burrrlioz(ssddata::ccme_boron)
ssd_hp(fit)
```

ssd_hp_bcanz	<i>BCANZ Hazard Proportion</i>
--------------	--------------------------------

Description

Gets proportion of species affected at specified concentration(s) using settings adopted by BC, Canada, Australia and New Zealand for official guidelines. This function can take several minutes to run with recommended 10,000 iterations.

Usage

```
ssd_hp_bcanz(
  x,
  conc = 1,
  ...,
  nboot = 10000,
  min_pboot = 0.95,
  proportion = FALSE
)
```

Arguments

<code>x</code>	The object.
<code>conc</code>	A numeric vector of concentrations to calculate the hazard proportions for.
<code>...</code>	Unused.
<code>nboot</code>	A count of the number of bootstrap samples to use to estimate the confidence limits. A value of 10,000 is recommended for official guidelines.
<code>min_pboot</code>	A number between 0 and 1 of the minimum proportion of bootstrap samples that must successfully fit (return a likelihood) to report the confidence intervals.
<code>proportion</code>	A numeric vector of proportion values to estimate hazard concentrations for.

Value

A tibble of corresponding hazard concentrations.

See Also

[ssd_hp\(\)](#).

Other BCANZ: [ssd_fit_bcanz\(\)](#), [ssd_hc_bcanz\(\)](#)

Examples

```
fits <- ssd_fit_bcanz(ssddata::ccme_boron)
ssd_hp_bcanz(fits, nboot = 100)
```

<code>ssd_is_censored</code>	<i>Is Censored</i>
------------------------------	--------------------

Description

Tests if an object has censored data.

Test if a data frame is censored.

Test if a fitdists object is censored.

Usage

```
ssd_is_censored(x, ...)

## S3 method for class 'data.frame'
ssd_is_censored(x, left = "Conc", right = left, ...)

## S3 method for class 'fitdists'
ssd_is_censored(x, ...)
```

Arguments

x	The object.
...	Unused.
left	A string of the column in data with the concentrations.
right	A string of the column in data with the right concentration values.

Value

A flag indicating whether an object is censored.

Examples

```
ssd_is_censored(ssddata::ccme_boron)
ssd_is_censored(data.frame(Conc = 1, right = 2), right = "right")

fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_is_censored(fits)
```

ssd_label_comma	<i>Label numbers with significant digits and comma</i>
-----------------	--

Description

Label numbers with significant digits and comma

Usage

```
ssd_label_comma(digits = 3, ..., big.mark = ",")
```

Arguments

digits	A whole number specifying the number of significant figures.
...	Unused.
big.mark	A string specifying used between every 3 digits to separate thousands on the x-axis.

Value

A "labelling" function that takes a vector x and returns a character vector of length(x) giving a label for each input value.

See Also

[scales::label_comma\(\)](#)

Examples

```
ggplot2::ggplot(data = ssddata::anon_e, ggplot2::aes(x = Conc / 10)) +
  geom_ssdpoint() +
  ggplot2::scale_x_log10(labels = ssd_label_comma())
```

ssd_label_comma_hc	<i>Label numbers with significant digits and comma. If hc_value is present in breaks, put on new line and make bold.</i>
--------------------	--

Description

Label numbers with significant digits and comma. If hc_value is present in breaks, put on new line and make bold.

Usage

```
ssd_label_comma_hc(hc_value, digits = 3, ..., big.mark = ",")
```

Arguments

hc_value	A number of the hazard concentration value to offset.
digits	A whole number specifying the number of significant figures.
...	Unused.
big.mark	A string specifying used between every 3 digits to separate thousands on the x-axis.

Value

A "labelling" function that takes a vector x and returns a character vector of length(x) giving a label for each input value.

See Also

[scales::label_comma\(\)](#)

Examples

```
ggplot2::ggplot(data = ssddata::anon_e, ggplot2::aes(x = Conc / 10)) +
  geom_ssdpoint() +
  ggplot2::scale_x_log10(labels = ssd_label_comma_hc(1.26))
```

ssd_licensing_md	<i>Licensing Markdown</i>
------------------	---------------------------

Description

A string of markdown code indicating the licensing of the code and documentation

Usage

```
ssd_licensing_md()
```

Examples

```
ssd_licensing_md()
```

ssd_match_moments	<i>Match Moments</i>
-------------------	----------------------

Description

Gets a named list of the values that produce the moment values (meanlog and sdlog) by distribution and term.

Usage

```
ssd_match_moments(
  dists = ssd_dists_bcanz(),
  meanlog = 1,
  sdlog = 1,
  ...,
  nsim = 1e+05
)
```

Arguments

dists	A character vector of the distribution names.
meanlog	The mean on the log scale.
sdlog	The standard deviation on the log scale.
...	Unused.
nsim	A positive whole number of the number of simulations to generate.

Value

a named list of the values that produce the moment values by distribution and term.

See Also

`estimates.fitdists()`, `ssd_hc()` and `ssd_plot_cdf()`

Examples

```
moments <- ssd_match_moments()
print(moments)
ssd_hc(moments)
ssd_plot_cdf(moments)
```

ssd_min_pmix

Calculate Minimum Proportion in Mixture Models

Description

Calculate Minimum Proportion in Mixture Models

Usage

```
ssd_min_pmix(n)
```

Arguments

`n` positive number of observations.

Value

A number between 0 and 0.5 of the minimum proportion in mixture models.

See Also

`ssd_fit_dists()`

Examples

```
ssd_min_pmix(6)
ssd_min_pmix(50)
```

ssd_pal	<i>Color-blind Palette for SSD Plots</i>
---------	--

Description

Color-blind Palette for SSD Plots

Usage

```
ssd_pal()
```

Value

A character vector of a color blind palette with 8 colors.

See Also

Other ggplot: [geom_hcintersect\(\)](#), [geom_ssdpnt\(\)](#), [geom_ssdssegment\(\)](#), [geom_xribbon\(\)](#), [scale_colour_ssd\(\)](#)

Examples

```
ssd_pal()
```

ssd_pburrrIII3	<i>Cumulative Distribution Function</i>
----------------	---

Description

Cumulative Distribution Function

Usage

```
ssd_pburrrIII3(  
  q,  
  shape1 = 1,  
  shape2 = 1,  
  scale = 1,  
  lower.tail = TRUE,  
  log.p = FALSE  
)
```

```
ssd_pgamma(q, shape = 1, scale = 1, lower.tail = TRUE, log.p = FALSE)
```

```
ssd_pgompertz(q, location = 1, shape = 1, lower.tail = TRUE, log.p = FALSE)
```

```

ssd_pinvpareto(q, shape = 3, scale = 1, lower.tail = TRUE, log.p = FALSE)

ssd_plgumbel(
  q,
  locationlog = 0,
  scalelog = 1,
  lower.tail = TRUE,
  log.p = FALSE
)

ssd_pllogis_llogis(
  q,
  locationlog1 = 0,
  scalelog1 = 1,
  locationlog2 = 1,
  scalelog2 = 1,
  pmix = 0.5,
  lower.tail = TRUE,
  log.p = FALSE
)

ssd_pllogis(q, locationlog = 0, scalelog = 1, lower.tail = TRUE, log.p = FALSE)

ssd_plnorm_lnorm(
  q,
  meanlog1 = 0,
  sdlog1 = 1,
  meanlog2 = 1,
  sdlog2 = 1,
  pmix = 0.5,
  lower.tail = TRUE,
  log.p = FALSE
)

ssd_plnorm(q, meanlog = 0, sdlog = 1, lower.tail = TRUE, log.p = FALSE)

ssd_pmulti(
  q,
  burrrIII3.weight = 0,
  burrrIII3.shape1 = 1,
  burrrIII3.shape2 = 1,
  burrrIII3.scale = 1,
  gamma.weight = 0,
  gamma.shape = 1,
  gamma.scale = 1,
  gompertz.weight = 0,
  gompertz.location = 1,
  gompertz.shape = 1,

```



```

    lgumbel.weight = 0,
    lgumbel.locationlog = 0,
    lgumbel.scalelog = 1,
    llogis.weight = 0,
    llogis.locationlog = 0,
    llogis.scalelog = 1,
    llogis_llogis.weight = 0,
    llogis_llogis.locationlog1 = 0,
    llogis_llogis.scalelog1 = 1,
    llogis_llogis.locationlog2 = 1,
    llogis_llogis.scalelog2 = 1,
    llogis_llogis.pmix = 0.5,
    lnorm.weight = 0,
    lnorm.meanlog = 0,
    lnorm.sdlog = 1,
    lnorm_lnorm.weight = 0,
    lnorm_lnorm.meanlog1 = 0,
    lnorm_lnorm.sdlog1 = 1,
    lnorm_lnorm.meanlog2 = 1,
    lnorm_lnorm.sdlog2 = 1,
    lnorm_lnorm.pmix = 0.5,
    weibull.weight = 0,
    weibull.shape = 1,
    weibull.scale = 1,
    lower.tail = TRUE,
    log.p = FALSE
)

ssd_pmulti_fitdists(q, fitdists, lower.tail = TRUE, log.p = FALSE)

ssd_pweibull(q, shape = 1, scale = 1, lower.tail = TRUE, log.p = FALSE)

```

Arguments

q	vector of quantiles.
shape1	shape1 parameter.
shape2	shape2 parameter.
scale	scale parameter.
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.
log.p	logical; if TRUE, probabilities p are given as $\log(p)$.
shape	shape parameter.
location	location parameter.
locationlog	location on the log scale parameter.
scalelog	scale on log scale parameter.
locationlog1	locationlog1 parameter.
scalelog1	scalelog1 parameter.

locationlog2	locationlog2 parameter.
scalelog2	scalelog2 parameter.
pmix	Proportion mixture parameter.
meanlog1	mean on log scale parameter.
sdlog1	standard deviation on log scale parameter.
meanlog2	mean on log scale parameter.
sdlog2	standard deviation on log scale parameter.
meanlog	mean on log scale parameter.
sdlog	standard deviation on log scale parameter.
burrrIII3.weight	weight parameter for the Burr III distribution.
burrrIII3.shape1	shape1 parameter for the Burr III distribution.
burrrIII3.shape2	shape2 parameter for the Burr III distribution.
burrrIII3.scale	scale parameter for the Burr III distribution.
gamma.weight	weight parameter for the gamma distribution.
gamma.shape	shape parameter for the gamma distribution.
gamma.scale	scale parameter for the gamma distribution.
gompertz.weight	weight parameter for the Gompertz distribution.
gompertz.location	location parameter for the Gompertz distribution.
gompertz.shape	shape parameter for the Gompertz distribution.
lgumbel.weight	weight parameter for the log-Gumbel distribution.
lgumbel.locationlog	location parameter for the log-Gumbel distribution.
lgumbel.scalelog	scale parameter for the log-Gumbel distribution.
llogis.weight	weight parameter for the log-logistic distribution.
llogis.locationlog	location parameter for the log-logistic distribution.
llogis.scalelog	scale parameter for the log-logistic distribution.
llogis_llogis.weight	weight parameter for the log-logistic log-logistic mixture distribution.
llogis_llogis.locationlog1	locationlog1 parameter for the log-logistic log-logistic mixture distribution.
llogis_llogis.scalelog1	scalelog1 parameter for the log-logistic log-logistic mixture distribution.
llogis_llogis.locationlog2	locationlog2 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.scalelog2
scalelog2 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.pmix
pmix parameter for the log-logistic log-logistic mixture distribution.

lnorm.weight
weight parameter for the log-normal distribution.

lnorm.meanlog
meanlog parameter for the log-normal distribution.

lnorm.sdlog
sdlog parameter for the log-normal distribution.

lnorm_lnorm.weight
weight parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.meanlog1
meanlog1 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.sdlog1
sdlog1 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.meanlog2
meanlog2 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.sdlog2
sdlog2 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.pmix
pmix parameter for the log-normal log-normal mixture distribution.

weibull.weight
weight parameter for the Weibull distribution.

weibull.shape
shape parameter for the Weibull distribution.

weibull.scale
scale parameter for the Weibull distribution.

fitdists
An object of class fitdists.

Functions

- `ssd_pburrrIII3()`: Cumulative Distribution Function for BurrIII Distribution
- `ssd_pgamma()`: Cumulative Distribution Function for Gamma Distribution
- `ssd_pgompertz()`: Cumulative Distribution Function for Gompertz Distribution
- `ssd_pinvpareto()`: Cumulative Distribution Function for Inverse Pareto Distribution
- `ssd_plgumbel()`: Cumulative Distribution Function for Log-Gumbel Distribution
- `ssd_pllogis_llogis()`: Cumulative Distribution Function for Log-Logistic/Log-Logistic Mixture Distribution
- `ssd_pllogis()`: Cumulative Distribution Function for Log-Logistic Distribution
- `ssd_plnorm_lnorm()`: Cumulative Distribution Function for Log-Normal/Log-Normal Mixture Distribution
- `ssd_plnorm()`: Cumulative Distribution Function for Log-Normal Distribution
- `ssd_pmulti()`: Cumulative Distribution Function for Multiple Distributions
- `ssd_pmulti_fitdists()`: Cumulative Distribution Function for Multiple Distributions
- `ssd_pweibull()`: Cumulative Distribution Function for Weibull Distribution

See Also

[ssd_q](#) and [ssd_r](#)

Examples

```
ssd_pburrrIII3(1)

ssd_pgamma(1)

ssd_pgompertz(1)

ssd_pinvpareto(1)

ssd_plgumbel(1)

ssd_pllogis_llogis(1)

ssd_pllogis(1)

ssd_plnorm_lnorm(1)

ssd_plnorm(1)

# multi
ssd_pmulti(1, gamma.weight = 0.5, lnorm.weight = 0.5)

# multi fitdists
fit <- ssd_fit_dists(ssddata::ccme_boron)
ssd_pmulti_fitdists(1, fit)

ssd_pweibull(1)
```

ssd_plot

Plot Species Sensitivity Data and Distributions

Description

Plots species sensitivity data and distributions.

Usage

```
ssd_plot(
  data,
  pred,
  left = "Conc",
  right = left,
  ...,
  label = NULL,
  shape = NULL,
```

```

    color = NULL,
    size,
    linetype = NULL,
    linecolor = NULL,
    xlab = "Concentration",
    ylab = "Species Affected",
    ci = TRUE,
    ribbon = TRUE,
    hc = 0.05,
    shift_x = 3,
    add_x = 0,
    bounds = c(left = 1, right = 1),
    big.mark = ",",
    suffix = "%",
    trans = "log10",
    xbreaks = waiver(),
    xlimits = NULL,
    text_size = 11,
    label_size = 2.5,
    theme_classic = FALSE
  )

```

Arguments

<code>data</code>	A data frame.
<code>pred</code>	A data frame of the predictions.
<code>left</code>	A string of the column in data with the concentrations.
<code>right</code>	A string of the column in data with the right concentration values.
<code>...</code>	Unused.
<code>label</code>	A string of the column in data with the labels.
<code>shape</code>	A string of the column in data for the shape aesthetic.
<code>color</code>	A string of the column in data for the color aesthetic.
<code>size</code>	A number for the size of the labels. Deprecated for <code>label_size</code> . #' [Deprecated]
<code>linetype</code>	A string of the column in pred to use for the linetype.
<code>linecolor</code>	A string of the column in pred to use for the line color.
<code>xlab</code>	A string of the x-axis label.
<code>ylab</code>	A string of the x-axis label.
<code>ci</code>	A flag specifying whether to estimate confidence intervals (by bootstrapping).
<code>ribbon</code>	A flag indicating whether to plot the confidence interval as a grey ribbon as opposed to green solid lines.
<code>hc</code>	A value between 0 and 1 indicating the proportion hazard concentration (or NULL).
<code>shift_x</code>	The value to multiply the label x values by (after adding <code>add_x</code>).

add_x	The value to add to the label x values (before multiplying by shift_x).
bounds	A named non-negative numeric vector of the left and right bounds for uncensored missing (0 and Inf) data in terms of the orders of magnitude relative to the extremes for non-missing values.
big.mark	A string specifying used between every 3 digits to separate thousands on the x-axis.
suffix	Additional text to display after the number on the y-axis.
trans	A string of which transformation to use. Accepted values include "log10", "log", and "identity" ("log10" by default).
xbreaks	The x-axis breaks as one of: • NULL for no breaks • waiver() for the default breaks • A numeric vector of positions
xlimits	The x-axis limits as one of: • NULL to use the default scale range • A numeric vector of length two providing the limits. Use NA to refer to the existing minimum or maximum limits.
text_size	A number for the text size.
label_size	A number for the size of the labels.
theme_classic	A flag specifying whether to use the classic theme or the default.

See Also

[ssd_plot_cdf\(\)](#) and [geom_ssdpoin\(\)](#)

Examples

```
ssd_plot(ssddata::ccme_boron, boron_pred, label = "Species", shape = "Group")
```

ssd_plot_cdf

Plot Cumulative Distribution Function (CDF)

Description

Generic function to plots the cumulative distribution function (CDF).

Usage

```
ssd_plot_cdf(x, ...)

## S3 method for class 'fitdists'
ssd_plot_cdf(x, average = FALSE, delta = 9.21, ...)

## S3 method for class 'list'
ssd_plot_cdf(x, ...)
```

Arguments

x	The object.
...	Additional arguments passed to <code>ssd_plot()</code> .
average	A flag specifying whether to provide model averaged values as opposed to a value for each distribution or if NA provides model averaged and individual values.
delta	A non-negative number specifying the maximum absolute AIC difference cutoff. Distributions with an absolute AIC difference greater than delta are excluded from the calculations.

Methods (by class)

- `ssd_plot_cdf(fitdists)`: Plot CDF for fitdists object
- `ssd_plot_cdf(list)`: Plot CDF for named list of distributional parameter values

See Also

`ssd_plot()`
`estimates.fitdists()` and `ssd_match_moments()`

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
ssd_plot_cdf(fits)
ssd_plot_cdf(fits, average = NA)

ssd_plot_cdf(list(
  llogis = c(locationlog = 2, scalelog = 1),
  lnorm = c(meanlog = 2, sdlog = 2)
))
```

ssd_plot_data

Plot Species Sensitivity Data

Description

Plots species sensitivity data.

Usage

```
ssd_plot_data(
  data,
  left = "Conc",
  right = left,
  ...,
  label = NULL,
```

```

    shape = NULL,
    color = NULL,
    size = 2.5,
    xlab = "Concentration",
    ylab = "Species Affected",
    shift_x = 3,
    add_x = 0,
    big.mark = ",",
    suffix = "%",
    bounds = c(left = 1, right = 1),
    trans = "log10",
    xbreaks = waiver()
  )

```

Arguments

<code>data</code>	A data frame.
<code>left</code>	A string of the column in data with the concentrations.
<code>right</code>	A string of the column in data with the right concentration values.
<code>...</code>	Unused.
<code>label</code>	A string of the column in data with the labels.
<code>shape</code>	A string of the column in data for the shape aesthetic.
<code>color</code>	A string of the column in data for the color aesthetic.
<code>size</code>	A number for the size of the labels. Deprecated for <code>label_size</code> . #' [Deprecated]
<code>xlab</code>	A string of the x-axis label.
<code>ylab</code>	A string of the x-axis label.
<code>shift_x</code>	The value to multiply the label x values by (after adding <code>add_x</code>).
<code>add_x</code>	The value to add to the label x values (before multiplying by <code>shift_x</code>).
<code>big.mark</code>	A string specifying used between every 3 digits to separate thousands on the x-axis.
<code>suffix</code>	Additional text to display after the number on the y-axis.
<code>bounds</code>	A named non-negative numeric vector of the left and right bounds for uncensored missing (0 and Inf) data in terms of the orders of magnitude relative to the extremes for non-missing values.
<code>trans</code>	A string of which transformation to use. Accepted values include "log10", "log", and "identity" ("log10" by default).
<code>xbreaks</code>	The x-axis breaks as one of: • NULL for no breaks • <code>waiver()</code> for the default breaks • A numeric vector of positions

See Also

[ssd_plot\(\)](#) and [geom_ssdpoint\(\)](#)

Examples

```
ssd_plot_data(ssddata::ccme_boron, label = "Species", shape = "Group")
```

ssd_qburrIII3

Quantile Function

Description

Quantile Function

Usage

```
ssd_qburrIII3(
  p,
  shape1 = 1,
  shape2 = 1,
  scale = 1,
  lower.tail = TRUE,
  log.p = FALSE
)
```

```
ssd_qgamma(p, shape = 1, scale = 1, lower.tail = TRUE, log.p = FALSE)
```

```
ssd_qgompertz(p, location = 1, shape = 1, lower.tail = TRUE, log.p = FALSE)
```

```
ssd_qinvpareto(p, shape = 3, scale = 1, lower.tail = TRUE, log.p = FALSE)
```

```
ssd_qlgumbel(
  p,
  locationlog = 0,
  scalelog = 1,
  lower.tail = TRUE,
  log.p = FALSE
)
```

```
ssd_qllogis_llogis(
  p,
  locationlog1 = 0,
  scalelog1 = 1,
  locationlog2 = 1,
  scalelog2 = 1,
  pmix = 0.5,
  lower.tail = TRUE,
  log.p = FALSE
)
```

```
ssd_qllogis(p, locationlog = 0, scalelog = 1, lower.tail = TRUE, log.p = FALSE)
```

```

ssd_qlnorm_lnorm(
  p,
  meanlog1 = 0,
  sdlog1 = 1,
  meanlog2 = 1,
  sdlog2 = 1,
  pmix = 0.5,
  lower.tail = TRUE,
  log.p = FALSE
)

```

```

ssd_qlnorm(p, meanlog = 0, sdlog = 1, lower.tail = TRUE, log.p = FALSE)

```

```

ssd_qmulti(
  p,
  burrIII3.weight = 0,
  burrIII3.shape1 = 1,
  burrIII3.shape2 = 1,
  burrIII3.scale = 1,
  gamma.weight = 0,
  gamma.shape = 1,
  gamma.scale = 1,
  gompertz.weight = 0,
  gompertz.location = 1,
  gompertz.shape = 1,
  lgumbel.weight = 0,
  lgumbel.locationlog = 0,
  lgumbel.scalelog = 1,
  llogis.weight = 0,
  llogis.locationlog = 0,
  llogis.scalelog = 1,
  llogis_llogis.weight = 0,
  llogis_llogis.locationlog1 = 0,
  llogis_llogis.scalelog1 = 1,
  llogis_llogis.locationlog2 = 1,
  llogis_llogis.scalelog2 = 1,
  llogis_llogis.pmix = 0.5,
  lnorm.weight = 0,
  lnorm.meanlog = 0,
  lnorm.sdlog = 1,
  lnorm_lnorm.weight = 0,
  lnorm_lnorm.meanlog1 = 0,
  lnorm_lnorm.sdlog1 = 1,
  lnorm_lnorm.meanlog2 = 1,
  lnorm_lnorm.sdlog2 = 1,
  lnorm_lnorm.pmix = 0.5,
  weibull.weight = 0,

```

```

    weibull.shape = 1,
    weibull.scale = 1,
    lower.tail = TRUE,
    log.p = FALSE
)

ssd_qmulti_fitdists(p, fitdists, lower.tail = TRUE, log.p = FALSE)

ssd_qweibull(p, shape = 1, scale = 1, lower.tail = TRUE, log.p = FALSE)

```

Arguments

p	vector of probabilities.
shape1	shape1 parameter.
shape2	shape2 parameter.
scale	scale parameter.
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.
log.p	logical; if TRUE, probabilities p are given as $\log(p)$.
shape	shape parameter.
location	location parameter.
locationlog	location on the log scale parameter.
scalelog	scale on log scale parameter.
locationlog1	locationlog1 parameter.
scalelog1	scalelog1 parameter.
locationlog2	locationlog2 parameter.
scalelog2	scalelog2 parameter.
pmix	Proportion mixture parameter.
meanlog1	mean on log scale parameter.
sdlog1	standard deviation on log scale parameter.
meanlog2	mean on log scale parameter.
sdlog2	standard deviation on log scale parameter.
meanlog	mean on log scale parameter.
sdlog	standard deviation on log scale parameter.
burrIII3.weight	weight parameter for the Burr III distribution.
burrIII3.shape1	shape1 parameter for the Burr III distribution.
burrIII3.shape2	shape2 parameter for the Burr III distribution.
burrIII3.scale	scale parameter for the Burr III distribution.
gamma.weight	weight parameter for the gamma distribution.

`gamma.shape` shape parameter for the gamma distribution.
`gamma.scale` scale parameter for the gamma distribution.
`gompertz.weight`
 weight parameter for the Gompertz distribution.
`gompertz.location`
 location parameter for the Gompertz distribution.
`gompertz.shape` shape parameter for the Gompertz distribution.
`lgumbel.weight` weight parameter for the log-Gumbel distribution.
`lgumbel.locationlog`
 location parameter for the log-Gumbel distribution.
`lgumbel.scalelog`
 scale parameter for the log-Gumbel distribution.
`llogis.weight` weight parameter for the log-logistic distribution.
`llogis.locationlog`
 location parameter for the log-logistic distribution.
`llogis.scalelog`
 scale parameter for the log-logistic distribution.
`llogis_llogis.weight`
 weight parameter for the log-logistic log-logistic mixture distribution.
`llogis_llogis.locationlog1`
 locationlog1 parameter for the log-logistic log-logistic mixture distribution.
`llogis_llogis.scalelog1`
 scalelog1 parameter for the log-logistic log-logistic mixture distribution.
`llogis_llogis.locationlog2`
 locationlog2 parameter for the log-logistic log-logistic mixture distribution.
`llogis_llogis.scalelog2`
 scalelog2 parameter for the log-logistic log-logistic mixture distribution.
`llogis_llogis.pmix`
 pmix parameter for the log-logistic log-logistic mixture distribution.
`lnorm.weight` weight parameter for the log-normal distribution.
`lnorm.meanlog` meanlog parameter for the log-normal distribution.
`lnorm.sdlog` sdlog parameter for the log-normal distribution.
`lnorm_lnorm.weight`
 weight parameter for the log-normal log-normal mixture distribution.
`lnorm_lnorm.meanlog1`
 meanlog1 parameter for the log-normal log-normal mixture distribution.
`lnorm_lnorm.sdlog1`
 sdlog1 parameter for the log-normal log-normal mixture distribution.
`lnorm_lnorm.meanlog2`
 meanlog2 parameter for the log-normal log-normal mixture distribution.
`lnorm_lnorm.sdlog2`
 sdlog2 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.pmix pmix parameter for the log-normal log-normal mixture distribution.

weibull.weight weight parameter for the Weibull distribution.

weibull.shape shape parameter for the Weibull distribution.

weibull.scale scale parameter for the Weibull distribution.

fitdists An object of class fitdists.

Functions

- `ssd_qburrIII3()`: Quantile Function for BurrIII Distribution
- `ssd_qgamma()`: Quantile Function for Gamma Distribution
- `ssd_qgompertz()`: Quantile Function for Gompertz Distribution
- `ssd_qinvpareto()`: Quantile Function for Inverse Pareto Distribution
- `ssd_qlgumbel()`: Quantile Function for Log-Gumbel Distribution
- `ssd_qllogis_llogis()`: Cumulative Distribution Function for Log-Logistic/Log-Logistic Mixture Distribution
- `ssd_qllogis()`: Cumulative Distribution Function for Log-Logistic Distribution
- `ssd_qlnorm_lnorm()`: Cumulative Distribution Function for Log-Normal/Log-Normal Mixture Distribution
- `ssd_qlnorm()`: Cumulative Distribution Function for Log-Normal Distribution
- `ssd_qmulti()`: Quantile Function for Multiple Distributions
- `ssd_qmulti_fitdists()`: Quantile Function for Multiple Distributions
- `ssd_qweibull()`: Cumulative Distribution Function for Weibull Distribution

See Also

[ssd_p](#) and [ssd_r](#)

Examples

```
ssd_qburrIII3(0.5)

ssd_qgamma(0.5)

ssd_qgompertz(0.5)

ssd_qinvpareto(0.5)

ssd_qlgumbel(0.5)

ssd_qllogis_llogis(0.5)

ssd_qllogis(0.5)

ssd_qlnorm_lnorm(0.5)
```

```

ssd_qlnorm(0.5)

# multi
ssd_qmulti(0.5, gamma.weight = 0.5, lnorm.weight = 0.5)

# multi fitdists
fit <- ssd_fit_dists(ssddata::ccme_boron)
ssd_qmulti_fitdists(0.5, fit)

ssd_qweibull(0.5)

```

ssd_rburrrIII3	<i>Random Number Generation</i>
----------------	---------------------------------

Description

Random Number Generation

Usage

```

ssd_rburrrIII3(n, shape1 = 1, shape2 = 1, scale = 1, chk = TRUE)

ssd_rgamma(n, shape = 1, scale = 1, chk = TRUE)

ssd_rgompertz(n, location = 1, shape = 1, chk = TRUE)

ssd_rinvpareto(n, shape = 3, scale = 1, chk = TRUE)

ssd_rlgumbel(n, locationlog = 0, scalelog = 1, chk = TRUE)

ssd_rllogis_llogis(
  n,
  locationlog1 = 0,
  scalelog1 = 1,
  locationlog2 = 1,
  scalelog2 = 1,
  pmix = 0.5,
  chk = TRUE
)

ssd_rllogis(n, locationlog = 0, scalelog = 1, chk = TRUE)

ssd_rlnorm_lnorm(
  n,
  meanlog1 = 0,
  sdlog1 = 1,
  meanlog2 = 1,
  sdlog2 = 1,

```

```

    pmix = 0.5,
    chk = TRUE
)

ssd_rlnorm(n, meanlog = 0, sdlog = 1, chk = TRUE)

ssd_rmulti(
  n,
  burrrIII3.weight = 0,
  burrrIII3.shape1 = 1,
  burrrIII3.shape2 = 1,
  burrrIII3.scale = 1,
  gamma.weight = 0,
  gamma.shape = 1,
  gamma.scale = 1,
  gompertz.weight = 0,
  gompertz.location = 1,
  gompertz.shape = 1,
  lgumbel.weight = 0,
  lgumbel.locationlog = 0,
  lgumbel.scalelog = 1,
  llogis.weight = 0,
  llogis.locationlog = 0,
  llogis.scalelog = 1,
  llogis_llogis.weight = 0,
  llogis_llogis.locationlog1 = 0,
  llogis_llogis.scalelog1 = 1,
  llogis_llogis.locationlog2 = 1,
  llogis_llogis.scalelog2 = 1,
  llogis_llogis.pmix = 0.5,
  lnorm.weight = 0,
  lnorm.meanlog = 0,
  lnorm.sdlog = 1,
  lnorm_lnorm.weight = 0,
  lnorm_lnorm.meanlog1 = 0,
  lnorm_lnorm.sdlog1 = 1,
  lnorm_lnorm.meanlog2 = 1,
  lnorm_lnorm.sdlog2 = 1,
  lnorm_lnorm.pmix = 0.5,
  weibull.weight = 0,
  weibull.shape = 1,
  weibull.scale = 1,
  chk = TRUE
)

ssd_rmulti_fitdists(n, fitdists, chk = TRUE)

ssd_rweibull(n, shape = 1, scale = 1, chk = TRUE)

```

Arguments

<code>n</code>	positive number of observations.
<code>shape1</code>	shape1 parameter.
<code>shape2</code>	shape2 parameter.
<code>scale</code>	scale parameter.
<code>chk</code>	A flag specifying whether to check the arguments.
<code>shape</code>	shape parameter.
<code>location</code>	location parameter.
<code>locationlog</code>	location on the log scale parameter.
<code>scalelog</code>	scale on log scale parameter.
<code>locationlog1</code>	locationlog1 parameter.
<code>scalelog1</code>	scalelog1 parameter.
<code>locationlog2</code>	locationlog2 parameter.
<code>scalelog2</code>	scalelog2 parameter.
<code>pmix</code>	Proportion mixture parameter.
<code>meanlog1</code>	mean on log scale parameter.
<code>sdlog1</code>	standard deviation on log scale parameter.
<code>meanlog2</code>	mean on log scale parameter.
<code>sdlog2</code>	standard deviation on log scale parameter.
<code>meanlog</code>	mean on log scale parameter.
<code>sdlog</code>	standard deviation on log scale parameter.
<code>burrrIII3.weight</code>	weight parameter for the Burr III distribution.
<code>burrrIII3.shape1</code>	shape1 parameter for the Burr III distribution.
<code>burrrIII3.shape2</code>	shape2 parameter for the Burr III distribution.
<code>burrrIII3.scale</code>	scale parameter for the Burr III distribution.
<code>gamma.weight</code>	weight parameter for the gamma distribution.
<code>gamma.shape</code>	shape parameter for the gamma distribution.
<code>gamma.scale</code>	scale parameter for the gamma distribution.
<code>gompertz.weight</code>	weight parameter for the Gompertz distribution.
<code>gompertz.location</code>	location parameter for the Gompertz distribution.
<code>gompertz.shape</code>	shape parameter for the Gompertz distribution.
<code>lgumbel.weight</code>	weight parameter for the log-Gumbel distribution.
<code>lgumbel.locationlog</code>	location parameter for the log-Gumbel distribution.

lgumbel.scalelog
scale parameter for the log-Gumbel distribution.

llogis.weight weight parameter for the log-logistic distribution.

llogis.locationlog
location parameter for the log-logistic distribution.

llogis.scalelog
scale parameter for the log-logistic distribution.

llogis_llogis.weight
weight parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.locationlog1
locationlog1 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.scalelog1
scalelog1 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.locationlog2
locationlog2 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.scalelog2
scalelog2 parameter for the log-logistic log-logistic mixture distribution.

llogis_llogis.pmix
pmix parameter for the log-logistic log-logistic mixture distribution.

lnorm.weight weight parameter for the log-normal distribution.

lnorm.meanlog meanlog parameter for the log-normal distribution.

lnorm.sdlog sdlog parameter for the log-normal distribution.

lnorm_lnorm.weight
weight parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.meanlog1
meanlog1 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.sdlog1
sdlog1 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.meanlog2
meanlog2 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.sdlog2
sdlog2 parameter for the log-normal log-normal mixture distribution.

lnorm_lnorm.pmix
pmix parameter for the log-normal log-normal mixture distribution.

weibull.weight weight parameter for the Weibull distribution.

weibull.shape shape parameter for the Weibull distribution.

weibull.scale scale parameter for the Weibull distribution.

fitdists An object of class fitdists.

Functions

- `ssd_rburrrIII3()`: Random Generation for BurrIII Distribution
- `ssd_rgamma()`: Random Generation for Gamma Distribution

- `ssd_rgompertz()`: Random Generation for Gompertz Distribution
- `ssd_rinvpareto()`: Random Generation for Inverse Pareto Distribution
- `ssd_rlgumbel()`: Random Generation for log-Gumbel Distribution
- `ssd_rllogis_llogis()`: Random Generation for Log-Logistic/Log-Logistic Mixture Distribution
- `ssd_rllogis()`: Random Generation for Log-Logistic Distribution
- `ssd_rlnorm_lnorm()`: Random Generation for Log-Normal/Log-Normal Mixture Distribution
- `ssd_rlnorm()`: Random Generation for Log-Normal Distribution
- `ssd_rmulti()`: Random Generation for Multiple Distributions
- `ssd_rmulti_fitdists()`: Random Generation for Multiple Distributions
- `ssd_rweibull()`: Random Generation for Weibull Distribution

See Also

[ssd_p](#) and [ssd_q](#)

Examples

```
withr::with_seed(50, {  
  x <- ssd_rburrrIII3(10000)  
})  
hist(x, breaks = 1000)  
  
withr::with_seed(50, {  
  x <- ssd_rgamma(10000)  
})  
hist(x, breaks = 1000)  
  
withr::with_seed(50, {  
  x <- ssd_rgompertz(10000)  
})  
hist(x, breaks = 1000)  
  
withr::with_seed(50, {  
  x <- ssd_rinvpareto(10000)  
})  
hist(x, breaks = 1000)  
  
withr::with_seed(50, {  
  x <- ssd_rlgumbel(10000)  
})  
hist(x, breaks = 1000)  
  
withr::with_seed(50, {  
  x <- ssd_rllogis_llogis(10000)  
})  
hist(x, breaks = 1000)
```

```

withr::with_seed(50, {
  x <- ssd_rllogis(10000)
})
hist(x, breaks = 1000)

withr::with_seed(50, {
  x <- ssd_rlnorm_lnorm(10000)
})
hist(x, breaks = 1000)

withr::with_seed(50, {
  x <- ssd_rlnorm(10000)
})
hist(x, breaks = 1000)

withr::with_seed(50, {
  x <- ssd_rmulti(1000, gamma.weight = 0.5, lnorm.weight = 0.5)
})
hist(x, breaks = 100)

# multi fitdists
fit <- ssd_fit_dists(ssddata::ccme_boron)
ssd_rmulti_fitdists(2, fit)

withr::with_seed(50, {
  x <- ssd_rweibull(10000)
})
hist(x, breaks = 1000)

```

ssd_sort_data

*Sort Species Sensitivity Data***Description**

Sorts Species Sensitivity Data by empirical cumulative density (ECD).

Usage

```
ssd_sort_data(data, left = "Conc", right = left)
```

Arguments

data	A data frame.
left	A string of the column in data with the concentrations.
right	A string of the column in data with the right concentration values.

Details

Useful for sorting data before using [geom_ssdpnt\(\)](#) and [geom_ssdssegment\(\)](#) to construct plots for censored data with `stat = identity` to ensure order is the same for the various components.

Value

data sorted by the empirical cumulative density.

See Also

[ssd_ecd_data\(\)](#) and [ssd_data\(\)](#)

Examples

```
ssd_sort_data(ssddata::ccme_boron)
```

subset.fitdists	<i>Subset fitdists Object</i>
-----------------	-------------------------------

Description

Select a subset of distributions from a fitdists object. The Akaike Information-theoretic Criterion differences are calculated after selecting the distributions named in select.

Usage

```
## S3 method for class 'fitdists'
subset(x, select = names(x), ..., delta = Inf, strict = TRUE)
```

Arguments

x	The object.
select	A character vector of the distributions to select.
...	Unused.
delta	A non-negative number specifying the maximum absolute AIC difference cutoff. Distributions with an absolute AIC difference greater than delta are excluded from the calculations.
strict	A flag indicating whether all elements of select must be present.

Examples

```
fits <- ssd_fit_dists(ssddata::ccme_boron)
subset(fits, c("gamma", "lnorm"))
```

tidy.fitdists	<i>Turn a fitdists Object into a Tibble</i>
---------------	---

Description

Turns a fitdists object into a tidy tibble of the estimates (est) and standard errors (se) by the terms (term) and distributions (dist).

Usage

```
## S3 method for class 'fitdists'  
tidy(x, all = FALSE, ...)
```

Arguments

x	The object.
all	A flag specifying whether to also return transformed parameters.
...	Unused.

Value

A tidy tibble of the estimates and standard errors.

See Also

[coef.fitdists\(\)](#)

Other generics: [augment.fitdists\(\)](#), [glance.fitdists\(\)](#)

Examples

```
fits <- ssd_fit_dists(ssdata::ccme_boron)  
tidy(fits)  
tidy(fits, all = TRUE)
```

Index

- * **BCANZ**
 - ssd_fit_bcanz, 30
 - ssd_hc_bcanz, 38
 - ssd_hp_bcanz, 41
- * **datasets**
 - ssdtools-ggproto, 19
- * **dists BCANZ**
 - ssd_dists_bcanz, 25
- * **dists**
 - ssd_dists, 23
 - ssd_dists_all, 24
 - ssd_dists_shiny, 26
- * **generics**
 - augment.fitdists, 3
 - glance.fitdists, 14
 - tidy.fitdists, 69
- * **ggplot**
 - geom_hcintersect, 6
 - geom_ssdpoint, 8
 - geom_ssdsegment, 10
 - geom_xribbon, 12
 - scale_colour_ssd, 18
 - ssd_pal, 47

aes(), 6, 8, 10, 13

augment.fitdists, 3, 15, 69

augment.fitdists(), 23

autoplot.fitdists, 4

borders(), 9, 12, 14

coef.fitdists, 5

coef.fitdists(), 69

dist_data, 24–26

estimates.fitdists, 5

estimates.fitdists(), 46, 55

fortify(), 7, 8, 10, 13

geom_hcintersect, 6, 10, 12, 14, 19, 47

geom_ssdpoint, 7, 8, 12, 14, 19, 47

geom_ssdpoint(), 54, 56, 67

geom_ssdsegment, 7, 10, 10, 14, 19, 47

geom_ssdsegment(), 67

geom_xribbon, 7, 10, 12, 12, 19, 47

GeomHcintersect (ssdtools-ggproto), 19

GeomSsdpoint (ssdtools-ggproto), 19

GeomSsdsegment (ssdtools-ggproto), 19

GeomXribbon (ssdtools-ggproto), 19

ggplot(), 7, 8, 10, 13

ggplot2::discrete_scale(), 19

ggplot2::ggproto(), 20

glance.fitdists, 4, 14, 69

glance.fitdists(), 35

grid::arrow(), 11

is.fitdists, 15

key glyphs, 7, 9, 11, 14

layer position, 9, 11, 13

layer stat, 9, 11, 13

layer(), 7, 9, 11, 13, 14

predict.fitburrrlioz, 16

predict.fitdists, 17

predict.fitdists(), 37

scale_color_ssd (scale_colour_ssd), 18

scale_colour_ssd, 7, 10, 12, 14, 18, 47

scale_fill_ssd (scale_colour_ssd), 18

scales::label_comma(), 43, 44

ssd_at_boundary, 20

ssd_censor_data, 21

ssd_computable, 22

ssd_data, 23

ssd_data(), 4, 29, 68

ssd_dists, 23, 25, 26

ssd_dists(), 25

ssd_dists_all, 24, 24, 26

ssd_dists_all(), 33
 ssd_dists_bcanz, 25
 ssd_dists_shiny, 24, 25, 26
 ssd_e(ssd_eburrrIII3), 26
 ssd_eburrrIII3, 26
 ssd_ecd, 28
 ssd_ecd(), 29
 ssd_ecd_data, 28
 ssd_ecd_data(), 23, 68
 ssd_egamma(ssd_eburrrIII3), 26
 ssd_egompertz(ssd_eburrrIII3), 26
 ssd_einvpareto(ssd_eburrrIII3), 26
 ssd_elgumbel(ssd_eburrrIII3), 26
 ssd_ellogis(ssd_eburrrIII3), 26
 ssd_ellogis_llogis(ssd_eburrrIII3), 26
 ssd_elnorm(ssd_eburrrIII3), 26
 ssd_elnorm_lnorm(ssd_eburrrIII3), 26
 ssd_emulti(ssd_eburrrIII3), 26
 ssd_eweibull(ssd_eburrrIII3), 26
 ssd_exposure, 29
 ssd_fit_bcanz, 30, 38, 42
 ssd_fit_burrrlioz, 31
 ssd_fit_dists, 32
 ssd_fit_dists(), 31, 46
 ssd_gof, 34
 ssd_gof(), 15
 ssd_hc, 35
 ssd_hc(), 6, 16–18, 33, 38, 39, 41, 46
 ssd_hc_bcanz, 31, 38, 42
 ssd_hp, 39
 ssd_hp(), 37, 42
 ssd_hp_bcanz, 31, 38, 41
 ssd_is_censored, 42
 ssd_label_comma, 43
 ssd_label_comma_hc, 44
 ssd_licensing_md, 45
 ssd_match_moments, 45
 ssd_match_moments(), 6, 55
 ssd_min_pmix, 46
 ssd_p, 27, 61, 66
 ssd_p(ssd_pburrrIII3), 47
 ssd_pal, 7, 10, 12, 14, 19, 47
 ssd_pburrrIII3, 47
 ssd_pgamma(ssd_pburrrIII3), 47
 ssd_pgompertz(ssd_pburrrIII3), 47
 ssd_pinvpareto(ssd_pburrrIII3), 47
 ssd_plgumbel(ssd_pburrrIII3), 47
 ssd_pllogis(ssd_pburrrIII3), 47
 ssd_pllogis_llogis(ssd_pburrrIII3), 47
 ssd_plnorm(ssd_pburrrIII3), 47
 ssd_plnorm_lnorm(ssd_pburrrIII3), 47
 ssd_plot, 52
 ssd_plot(), 16, 18, 55, 56
 ssd_plot_cdf, 54
 ssd_plot_cdf(), 4, 6, 7, 10, 12, 14, 20, 33, 46, 54
 ssd_plot_data, 55
 ssd_pmulti(ssd_pburrrIII3), 47
 ssd_pmulti_fitdists(ssd_pburrrIII3), 47
 ssd_pweibull(ssd_pburrrIII3), 47
 ssd_q, 27, 52, 66
 ssd_q(ssd_qburrrIII3), 57
 ssd_qburrrIII3, 57
 ssd_qgamma(ssd_qburrrIII3), 57
 ssd_qgompertz(ssd_qburrrIII3), 57
 ssd_qinvpareto(ssd_qburrrIII3), 57
 ssd_qlgumbel(ssd_qburrrIII3), 57
 ssd_qllogis(ssd_qburrrIII3), 57
 ssd_qllogis_llogis(ssd_qburrrIII3), 57
 ssd_qlnorm(ssd_qburrrIII3), 57
 ssd_qlnorm_lnorm(ssd_qburrrIII3), 57
 ssd_qmulti(ssd_qburrrIII3), 57
 ssd_qmulti_fitdists(ssd_qburrrIII3), 57
 ssd_qweibull(ssd_qburrrIII3), 57
 ssd_r, 52, 61
 ssd_r(ssd_rburrrIII3), 62
 ssd_rburrrIII3, 62
 ssd_rgamma(ssd_rburrrIII3), 62
 ssd_rgompertz(ssd_rburrrIII3), 62
 ssd_rinvpareto(ssd_rburrrIII3), 62
 ssd_rlgumbel(ssd_rburrrIII3), 62
 ssd_rllogis(ssd_rburrrIII3), 62
 ssd_rllogis_llogis(ssd_rburrrIII3), 62
 ssd_rlnorm(ssd_rburrrIII3), 62
 ssd_rlnorm_lnorm(ssd_rburrrIII3), 62
 ssd_rmulti(ssd_rburrrIII3), 62
 ssd_rmulti_fitdists(ssd_rburrrIII3), 62
 ssd_rweibull(ssd_rburrrIII3), 62
 ssd_sort_data, 67
 ssd_sort_data(), 23
 ssdtools-ggproto, 19
 stats::optim(), 18, 31, 33, 37, 41
 StatSsdpoint(ssdtools-ggproto), 19
 StatSsdsegment(ssdtools-ggproto), 19
 subset.fitdists, 68
 tidy.fitdists, 4, 15, 69

`tidy.fitdists()`, [5](#), [6](#)