Package ‘RNeXML’

June 18, 2020

Type Package

Title Semantically Rich I/O for the ‘NeXML’ Format

Version 2.4.5

Description Provides access to phyloinformatic data in ‘NeXML’ format. The package should add new functionality to R such as the possibility to manipulate ‘NeXML’ objects in more various and refined way and compatibility with ‘ape’ objects.

URL https://docs.ropensci.org/RNeXML,
     https://github.com/ropensci/RNeXML

BugReports https://github.com/ropensci/RNeXML/issues

License BSD_3_clause + file LICENSE

VignetteBuilder knitr

Suggests spelling, rdflib, geiger (>= 2.0), phytools (>= 0.3.93), knitr (>= 1.5), rfigshare (>= 0.3.0), knitr citations (>= 1.0.1), testthat (>= 0.10.0), rmarkdown (>= 0.3.3), rlang, xslt, covr, taxadb

Depends R (>= 3.0.0), ape (>= 3.1), methods (>= 3.0.0)

Imports XML (>= 3.95), plyr (>= 1.8), reshape2 (>= 1.2.2), httr (>= 0.3), uuid (>= 0.1-1), dplyr (>= 0.5.0), lazyeval (>= 0.1.0), tidyr (>= 0.3.1), stringr (>= 1.0), stringi, xml2

RoxygenNote 7.1.0.9000
X-schema.org-applicationCategory Data Publication
X-schema.org-keywords metadata, nexml, phylogenetics, linked-data
X-schema.org-isPartOf https://ropensci.org
Language en-US
Encoding UTF-8
NeedsCompilation no

Author Carl Boettiger [cre, aut] (https://orcid.org/0000-0002-1642-628X),
Scott Chamberlain [aut] (https://orcid.org/0000-0003-1444-9135),
Hilmar Lapp [aut] (https://orcid.org/0000-0001-9107-0714),
Kseniia Shumelchyk [aut],
Rutger Vos [aut] (https://orcid.org/0000-0001-9254-7318)
Maintainer Carl Boettiger <cboettig@gmail.com>
Repository CRAN
Date/Publication 2020-06-18 18:40:02 UTC

R topics documented:

.callGeneric .................................................. 3
.methodWithNext ............................................. 4
.sigLabel ....................................................... 5
add_basic_meta .............................................. 5
add_characters ............................................... 7
add_meta ....................................................... 8
add_namespaces ............................................. 9
add_trees ..................................................... 10
Annotated-class ............................................. 11
c.meta-method ............................................... 11
c.nexml-method ............................................ 12
charzero_as_empty .......................................... 12
coalesce_ ..................................................... 13
expand_prefix ............................................... 13
findNextMethod ............................................. 15
flatten_multiphylo ......................................... 16
get_all_meta ............................................... 16
get_characters .............................................. 17
get_characters_list ....................................... 18
get_citation ............................................... 19
get_flat_trees ............................................. 20
get_level .................................................... 20
get_license .................................................. 21
get_meta ..................................................... 22
get_metadata ............................................... 23
get_metadata_values ...................................... 24
get_namespaces ............................................. 24
.callGeneric

Calls the given generic with the given arguments

Description

Calls the given generic with the given arguments, using the method whose signature matches the arguments.

Usage

.callGeneric(f, ..., .package = NULL)

Arguments

f the generic, as a character string or a standardGeneric object
...

the arguments (named and/or unnamed) with which to call the matching method

.package

the package name for finding the generic (if f is a character string); by default the package is determined from the calling environment
Details

Uses methods::selectMethod() to find the matching method. In theory, this is at best wholly redundant with what standard S4 generics already do by themselves. However, the generics dispatch for S4 seems (at least currently) broken at least if the first argument in the signature is a class that name-clashes with a class defined in another package. In that case, whether the standard dispatch works correctly or not can depend on search() order, and can change within a session depending on the order in which packages are loaded.

Value

the value returned by the method

Description

Promotes the given method definition to an instance of MethodWithNext, thereby recording the next method in the nextMethod slot.

Usage

.methodWithNext(method, nextMethod, .cache = FALSE)

Arguments

method the MethodDefinition object to promote
nextMethod the MethodDefinition object to record as the next method
.cache whether to cache the promoted method definition object (using methods::cacheMethod())

Value

an instance of MethodWithNext, which has the next method in the nextMethod slot

Note

MethodWithNext objects are normally returned by methods::addNextMethod(), but a constructor function for the class seems missing (or is undocumented?). This provides one.
.sigLabel

Create a label for a method signature

Description

Creates a label for a signature mirroring the result of .sigLabel() in the methods package, which unfortunately does not export the function. This is needed, for example, for the excluded slot in the MethodWithNext class.

Usage

.sigLabel(signature)

Arguments

signature the signature for which to create a label, as a vector or list of strings, or as an instance of signature.

Value

a character string

add_basic_meta Add basic metadata

Description

adds Dublin Core metadata elements to (top-level) nexml

Usage

add_basic_meta(
  title = NULL,
  description = NULL,
  creator = Sys.getenv("USER"),
  pubdate = NULL,
  rights = "CC0",
  publisher = NULL,
  citation = NULL,
  nexml = new("nexml")
)
Arguments

- **title**: A title for the dataset
- **description**: a description of the dataset
- **creator**: name of the data creator. Can be a string or R person object
- **pubdate**: publication date. Default is current date.
- **rights**: the intellectual property rights associated with the data. The default is Creative Commons Zero (CC0) public domain declaration, compatible with all other licenses and appropriate for deposition into the Dryad or figshare repositories. CC0 is also recommended by the Panton Principles. Alternatively, any other plain text string can be added and will be provided as the content attribute to the dc:rights property.
- **publisher**: the publisher of the dataset. Usually where a user may go to find the canonical copy of the dataset: could be a repository, journal, or academic institution.
- **citation**: a citation associated with the data. Usually an academic journal article that indicates how the data should be cited in an academic context. Multiple citations can be included here. citation can be a plain text object, but is preferably an R citation or bibentry object (which can include multiple citations. See examples
- **nexml**: a nexml object to which metadata should be added. A new nexml object will be created if none exists.

Details

`add_basic_meta()` is just a wrapper for `add_meta` to make it easy to provide generic metadata without explicitly providing the namespace. For instance, `add_basic_meta(title="My title",description="a description")` is identical to: `add_meta(list(meta("dc:title","My title"),meta("dc:description","a description")))` Most function arguments are mapped directly to the Dublin Core terms of the same name, with the exception of rights, which by default maps to the Creative Commons namespace when using CC0 license.

Value

an updated nexml object

See Also

`add_trees add_characters add_meta`

Examples

```r
nex <- add_basic_meta(title = "My test title",
                      description = "A description of my test",
                      creator = "Carl Boettiger <cboettig@gmail.com>",
                      publisher = "unpublished data",
                      pubdate = "2012-04-01")

## Adding citation to an R package:
```
add_characters

Add character data to a nexml object

Description

Add character data to a nexml object

Usage

add_characters(x, nexml = new("nexml"), append_to_existing_otus = FALSE)

Arguments

x character data, in which character traits labels are column names and taxon labels are row names. x can be in matrix or data.frame format.

nexml a nexml object, if appending character table to an existing nexml object. If omitted will initiate a new nexml object.

append_to_existing_otus logical. If TRUE, will add any new taxa (taxa not matching any existing otus block) to the existing (first) otus block. Otherwise (default), a new otus block is created, even though it may contain duplicate taxa to those already present. While FALSE is the safe option, TRUE may be appropriate when building nexml files from scratch with both characters and trees.

Examples

library("geiger")
data(geospiza)
geiger_nex <- add_characters(geospiza$dat)
add_meta  

Add metadata to a nexml file

Description
Add metadata to a nexml file

Usage

```r
add_meta(
  meta,
  nexml = new("nexml"),
  level = c("nexml", "otus", "trees", "characters"),
  namespaces = NULL,
  i = 1,
  at_id = NULL
)
```

Arguments

- **meta**: a meta S4 object, e.g. output of the function `meta`, or a list of these meta objects
- **nexml**: (S4) object
- **level**: the level at which the metadata annotation should be added.
- **namespaces**: named character string for any additional namespaces that should be defined.
- **i**: for otus, trees, characters: if there are multiple such blocks, which one should be annotated? Default is first/only block.
- **at_id**: the id of the element to be annotated. Optional, advanced use only.

Value

the updated nexml object

See Also

- `meta`
- `add_trees`
- `add_characters`
- `add_basic_meta`

Examples

```r
## Create a new nexml object with a single metadata element:
modified <- meta(property = "prism:modificationDate", content = "2013-10-04")
nex <- add_meta(modified)  # Note: 'prism' is defined in nexml_namespaces by default.

## Write multiple metadata elements, including a new namespace:
website <- meta(href = "http://carlboettiger.info",
               rel = "foaf:homepage")  # meta can be link-style metadata
nex <- add_meta(list(modified, website),
                namespaces = c(foaf = "http://xmlns.com/foaf/0.1/"))
```
## Append more metadata, and specify a level:

```r
history <- meta(property = "skos:historyNote",
    content = "Mapped from the bird.orders data in the ape package using RNeXML")
```

```r
data(bird.orders)
nex <- add_trees(bird.orders) # need to have created a trees block first
nex <- add_meta(history,
    nexml = nex,
    level = "trees",
    namespaces = c(skos = "http://www.w3.org/2004/02/skos/core#"))
```

---

**add_namespaces**

**Add namespaces**

**Description**

Add namespaces and their prefixes as a named vector of URIs, with the names being the prefixes. Namespaces have most relevance for meta objects' `rel` and `property`, and for embedded XML literals.

**Usage**

```r
add_namespaces(namespaces, nexml = new("nexml"))
```

**Arguments**

- `namespaces`: a named character vector of namespaces
- `nexml`: a nexml object. will create a new one if none is given.

**Details**

The implementation attempts to avoid duplication, currently using the prefix. I.e., namespaces with prefixes already defined will not get added. Namespaces needed by the NeXML format, and for commonly used metadata terms, are already included by default, see `get_namespaces()`.

**Value**

A nexml object with updated namespaces

**Note**

Often a user won’t call this directly, but instead provide the namespace(s) through `add_meta()`.

**See Also**

`meta()` `add_meta()` `get_namespaces()`
Examples

```r
## Write multiple metadata elements, including a new namespace:
website <- meta(href = "http://carlboettiger.info",
    rel = "foaf:homepage")  # meta can be link-style metadata
modified <- meta(property = "prism:modificationDate",
    content = "2013-10-04")

nex <- add_meta(list(modified, website),
    namespaces = c(foaf = "http://xmlns.com/foaf/0.1/"))
# prism prefix already included by default

## Add namespace "by hand" before adding meta:
nex <- add_namespaces(c(skos = "http://www.w3.org/2004/02/skos/core#"),
    nexml = nex)
history <- meta(property = "skos:historyNote",
    content = "Mapped from the bird.orders data in the ape package using RNeXML")

nex <- add_meta(history, nexml = nex)
```

Description

add_trees

Usage

```r
add_trees(phy, nexml = new("nexml"), append_to_existing_otus = FALSE)
```

Arguments

- **phy**: a phylo object, multiPhylo object, or list of multiPhylo to be added to the nexml
- **nexml**: a nexml object to which we should append this phylo. By default, a new nexml object will be created.
- **append_to_existing_otus**: logical, indicating if we should make a new OTU block (default) or append to the existing one.

Value

A nexml object containing the phy innexml format.

Examples

```r
library("geiger")
data(geospiza)
geiger_nex <- add_trees(geospiza$phy)
```
Annotated-class

Class of objects that have metadata as lists of meta elements

Description

Class of objects that have metadata as lists of meta elements

Slots

meta list of meta objects
about for RDF extraction, the identifier for the resource that this object is about

c, meta-method Concatenate meta elements into a ListOfmeta

Description

Concatenate meta elements into a ListOfmeta
Concatenate ListOfmeta elements into a flat ListOfmeta

Usage

## S4 method for signature 'meta'
c(x, ..., recursive = TRUE)

## S4 method for signature 'ListOfmeta'
c(x, ..., recursive = TRUE)

Arguments

x, ... meta and ListOfmeta elements to be concatenated, see meta
recursive logical, if 'recursive=TRUE', the function recursively descends through lists and combines their elements into a flat vector. This method does not support recursive=FALSE, use list instead.

Value

a ListOfmeta object containing a flat list of meta elements.

Examples

c(meta(content="example", property="dc:title"),
  meta(content="Carl", property="dc:creator"))
metalist <- c(meta(content="example", property="dc:title"),
  meta(content="Carl", property="dc:creator"))
out <- c(metalist, metalist)
out <- c(metalist, meta(content="a", property="b"))
c.nexml-method

Concatenate nexml files

Description

Concatenate nexml files

Usage

## S4 method for signature 'nexml'
c(x, ..., recursive = FALSE)

Arguments

x, ... nexml objects to be concatenated, e.g. from write.nexml or read.nexml. Must have unique ids on all elements
recursive logical. If 'recursive = TRUE', the function recursively descends through lists (and pairlists) combining all their elements into a vector. (Not implemented).

Value

a concatenated nexml file

Examples

## Not run:
f1 <- system.file("examples", "trees.xml", package="RNeXML")
f2 <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex1 <- read.nexml(f1)
nex2 <- read.nexml(f2)
nex <- c(nex1, nex2)

## End(Not run)

charzero_as_empty

Treats zero-length character vectors as empty strings

Description

If the argument is a zero-length character vector (character(0)), returns an empty string (which is a character vector of length 1). Otherwise passes through the argument.

Usage

charzero_as_empty(x)
Arguments

x  the object to be tested for zero-length character vector

Value

an empty string if x is a character vector of length zero, and x otherwise

---

**coalesce_**  
*Front-end to dplyr::coalesce to deal with NULL vectors*

---

**Description**

Replaces any NULL argument with a vector of NA, and casts every vector to the same type as the last vector. After that, calls `dplyr::coalesce()`.

**Usage**

`coalesce_(...)`

**Arguments**

...  the vectors to coalesce on NA

**Value**

a vector of the same type and length as the last argument

**See Also**

`dplyr::coalesce()`

---

**expand_prefix**  
*Expand namespace-prefixed string*

---

**Description**

Substitutes the namespace prefix in the input vector of strings with the corresponding namespaces.

**Usage**

`expand_prefix(x, namespaces = NULL)`
Arguments

- `x` a character vector of potentially namespace-prefixed strings
- `namespaces` a named vector of namespaces, with namespace prefixes being the names. A "base" namespace with an empty name can be included. If not provided, or if empty, the input vector is returned as is.

Details

Namespace prefixes are expected to be separated by one or more semicolons. Prefixes that cannot be matched to the vector of namespaces will be left as is. For strings that do not have a namespace prefix, the vector of namespaces can contain a base namespace, identified as not having a name, with which these strings will be expanded.

Value

a character vector, of the same length as the input vector

Examples

```r
uris <- c("cc:license", "dc:title")
ns <- c(dc = "http://purl.org/dc/elements/1.1/",
   dcterms = "http://purl.org/dc/terms/",
   dct = "http://purl.org/dc/terms/",
   cc = "http://creativecommons.org/ns#")
# expansion is vectorized
expand_prefix(uris, ns)

# strings with non-matching or no prefix are left as is
uris <- c(uris, "my:title", "title")
expand_prefix(uris, ns)

# NAs in the input list become NA in the output
uris <- c(uris, NA)
expand_prefix(uris, ns)

# can include a "base" (unnamed) namespace for expanding unprefix strings
ns <- c(ns, "/local/")
xuris <- expand_prefix(uris, ns)
xuris
xuris[xuris == "title"] == paste0("/local/", uris[xuris == "title"])

# different prefixes may expand to the same result
expand_prefix("dcterms:modified", ns) == expand_prefix("dct:modified", ns)

# or they may result in different expansions
expand_prefix("dc:title", ns) != expand_prefix("dcterms:title", ns)
```
**findNextMethod**

Finds the method that `callNextMethod()` should chain to

**Description**

Attempts to find the "next" method in the inheritance chain. This would (ideally) be the method that `methods::callNextMethod()` would chain to, as a result of the method `methods::addNextMethod()` would find (and return in the `nextMethod` slot of the `MethodWithNext` object). Hence, in theory one shouldn’t ever need this, but unfortunately `addNextMethod()` is broken (and errors out) if one of the classes in the signature name-clashes with an S4 class defined in another package that is loaded.

**Usage**

```r
findNextMethod(method, f = NULL, envir = topenv())
```

**Arguments**

- `method` `MethodDefinition`, the method for which to find the next method
- `f` `standardGeneric`, the standard generic for which to find the next method. By default this will be obtained from `method`.
- `envir` the environment in which to find the method

**Details**

The next method will be determined by the S4 inheritance chain. However, this function will walk only the inheritance chain of those arguments in the signature that are defined in the package of the generic method from which this function was invoked (directly or indirectly). If there are no such parameters in the signature, or if there is more than one, finding the next method is handed off to `methods::addNextMethod()`.

**Value**

A `MethodDefinition` object that is the next method in the chain by inheritance

**Note**

In theory a class name clash between packages shouldn’t be a problem because class names can be namespaced, and the `MethodDefinition` object passed to `addNextMethod()` has all the necessary namespace information. Hopefully, at some point this gets fixed in R, and then we don’t need this anymore.
`flatten_multiphylo`  *Flatten a multiphylo object*

**Description**

Flatten a multiphylo object

**Usage**

`flatten_multiphylo(object)`

**Arguments**

- **object** a list of multiphylo objects

**Details**

NeXML has the concept of multiple `<trees>` nodes, each with multiple child `<tree>` nodes. This maps naturally to a list of multiphylo objects. Sometimes this hierarchy conveys important structural information, so it is not discarded by default. Occasionally it is useful to flatten the structure though, hence this function. Note that this discards the original structure, and the nxml file must be parsed again to recover it.

`get_all_meta`  *Get flattened list of meta annotations*

**Description**

Collects recursively (in the case of nested meta annotations) all meta object annotations for the given object, and returns the result as a flat list.

**Usage**

`get_all_meta(annotated)`

**Arguments**

- **annotated** the object from which to extract meta object annotations

**Details**

Does not check that the input object can actually have meta annotations. An invalid slot error will be generated if it can’t.

**Value**

a flat list of meta objects
get_characters

Get character data.frame from nexml

Description

Get character data.frame from nexml

Usage

get_characters(
  nex,
  rownames_as_col = FALSE,
  otu_id = FALSE,
  otus_id = FALSE,
  include_state_types = FALSE
)

Arguments

nex          a nexml object
rownames_as_col
  option to return character matrix rownames (with taxon ids) as it's own column in the data.frame. Default is FALSE for compatibility with geiger and similar packages.
otu_id       logical, default FALSE. return a column with the otu id (for joining with otu metadata, etc)
otus_id      logical, default FALSE. return a column with the otus block id (for joining with otu metadata, etc)
include_state_types
  logical, default FALSE. whether to also return a matrix of state types (with values standard, polymorphic, and uncertain)

Details

RNeXML will attempt to return the matrix using the NeXML taxon (otu) labels to name the rows and the NeXML char labels to name the traits (columns). If these are unavailable or not unique, the NeXML id values for the otus or traits will be used instead.

Value

the character matrix as a data.frame, or if include_state_types is TRUE a list of two elements, characters as the character matrix, and state_types as a matrix of state types. Both matrices will be in the same ordering of rows and columns.
Examples

```r
## Not run:
# A simple example with a discrete and a continuous trait
f <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- read.nexml(f)
get_characters(nex)

# A more complex example -- currently ignores sequence-type characters
f <- system.file("examples", "characters.xml", package="RNeXML")
nex <- read.nexml(f)
get_characters(nex)

# if polymorphic or uncertain states need special treatment, request state
# types to be returned as well:
f <- system.file("examples", "ontotrace-result.xml", package="RNeXML")
nex <- read.nexml(f)
res <- get_characters(nex, include_state_types = TRUE)
row.has.p <- apply(res$state_types, 1,
  function(x) any(x == "polymorphic", na.rm = TRUE))
col.has.p <- apply(res$state_types, 2,
  function(x) any(x == "polymorphic", na.rm = TRUE))
res$characters[row.has.p, col.has.p, drop=FALSE] # polymorphic rows and cols
res$characters[!row.has.p, drop=FALSE] # drop taxa with polymorphic states
m1 <- mapply(function(s, s.t) ifelse(s.t == "standard", s, "?"),
  res$characters, res$state_types)
row.names(m1) <- row.names(res$characters)
m1

## End(Not run)
```

---

### get_characters_list

**Extract the character matrix**

**Description**

Extract the character matrix

**Usage**

```r
get_characters_list(nexml, rownames_as_col = FALSE)
```

**Arguments**

- `nexml`: nexml object (e.g. from read.nexml)
- `rownames_as_col`: option to return character matrix rownames (with taxon ids) as it’s own column in the data.frame. Default is FALSE for compatibility with geiger and similar packages.
get_citation

Value

the list of taxa

Examples

```r
comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nxml_read(comp_analysis)
get_characters_list(nex)
```

---

**get_citation**

*Get citation from metadata*

**Description**

Extracts the citation annotation from the metadata annotation of the `nxml` object, and returns its value.

**Usage**

```r
get_citation(nexml)
```

**Arguments**

- `nexml` a `nxml` object

**Details**

Currently the implementation looks for `dcterms:bibliographicCitation` annotations. (Note that these may be given with any prefix in the metadata so long as they expand to the same full property URIs.)

**Value**

the citation if the metadata provides one that is non-empty, and NA otherwise. If multiple non-empty annotations are found, only the first one is returned.

**See Also**

- `get_metadata_values()`
### get_flat_trees

**Description**

extract a single multiPhylo object containing all trees in the nexml

**Usage**

```r
get_flat_trees(nexml)
```

**Arguments**

- `nexml` a representation of the nexml object from which the data is to be retrieved

**Details**

Note that this method collapses any hierarchical structure that may have been present as multiple trees nodes in the original nexml (though such a feature is rarely used). To preserve that structure, use `get_trees` instead.

**Value**

a multiPhylo object (list of ape::phylo objects). See details.

**See Also**

- `get_trees`
- `get_item`

**Examples**

```r
comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nexml_read(comp_analysis)
get_flat_trees(nex)
```

---

### get_level

**Description**

get a data.frame of attribute values of a given node

**Usage**

```r
get_level(nex, level)
```

**See Also**

- `get_trees`
- `get_item`
get_license

Arguments

nex  a nexml object
level  a character vector indicating the class of node, see details

Details

level should be a character vector giving the path to the specified node group. For instance, otus, characters, and trees are top-level blocks (e.g. child nodes of the root nexml block), and can be specified directly. To get metadata for all "char" elements from all characters blocks, you must specify that char nodes are child nodes to character nodes: e.g. get_level(nex,"characters/char"), or similarly for states: get_level(nex,characters/states).

The return object is a data frame whose columns are the attribute names of the elements specified. The column names match the attribute names except for "id" attribute, for which the column is renamed using the node itself. (Thus <otus id="os2"> would be rendered in a data.frame with column called "otus" instead of "id"). Additional columns are added for each parent element in the path: e.g. get_level(nex,"otus/otu") would include a column named "otus" with the id of each otus block. Even though the method always returns the data frame for all matching nodes in all blocks, these ids let you see which otu values came from which otus block. This is identical to the function call get_taxa(). Similarly, get_level(nex,"otus/otu/meta") would return additional columns 'otus' and also a column, 'otu', with the otu parent ids of each metadata block. (This is identical to a function call to get_metadata). This makes it easier to join data.frames as well, see examples

Value

Returns the attributes of specified class of nodes as a data.frame

get_license

Get license from metadata

Description

Extracts the license annotation from the metadata annotation of the nexml object, and returns its value.

Usage

get_license(nexml)

Arguments

nexml  a nexml object

Details

Currently the implementation looks for cc:license and dc:rights annotations. (Note that these may be given with any prefix in the metadata so long as they expand to the same full property URIs.)
get_meta

Value
the license if the metadata asserts one that is non-empty, and NA otherwise. If multiple non-empty annotations are found, only the first one is returned.

See Also
get_metadata_values()

description
Extracts the metadata annotations for the given property or properties, and returns the result as a list of meta objects.

Usage
get_meta(nexml, annotated = NULL, props)

Arguments
nexml a nexml object
annotated the nexml component object from which to obtain metadata annotations, or a list of such objects. Defaults to the nexml object itself.
props a character vector of property names for which to extract metadata annotations

Details
For matching property identifiers (i.e., URIs), prefixes in the input list as well as in the annotated object will be expanded using the namespaces of the nexml object. Names in the returned list are mapped to the (possibly prefixed) form in the input list. The resulting list is flat, and hence does not retain the nesting hierarchy in the object’s annotation.

Value
a named list of the matching meta objects
get_metadata

Description

get_metadata

Usage

get_metadata(nexml, level = "nexml", simplify = TRUE)

Arguments

nexml  a nexml object
level   the name of the level of element desired, see details
simplify  logical, see Details

Details

'level' should be either the name of a child element of a NeXML document (e.g. "otu", "characters"), or a path to the desired element, e.g. 'trees/tree' will return the metadata for all phylogenies in all trees blocks.

If a metadata element has other metadata elements nested within it, the nested metadata are returned as well. A column "Meta" will contain the IDs consolidated from the type-specific LiteralMeta and ResourceMeta columns, and IDs are generated for meta elements that have nested elements but do not have an ID ("blank nodes"). A column "meta" contains the IDs of the parent meta elements for nested ones. This means that the resulting table can be self-joined on those columns.

If simplify is FALSE, the type-specific "LiteralMeta" and "ResourceMeta" columns will be retained even if a consolidated "Meta" column is present. Otherwise, only the consolidated column will be included in the result. Also, if simplify is TRUE the values for "property" (LiteralMeta) and "rel" (ResourceMeta) will be consolidated to "property", and "rel" will be removed from the result.

Value

the requested metadata as a data.frame. Additional columns indicate the parent element of the return value.

Examples

## Not run:
comp_analysis <- system.file("examples", "primates.xml", package="RNeXML")
 nex <- nexml_read(comp_analysis)
 get_metadata(nex)
 get_metadata(nex, "otus/otu")

## End(Not run)
get_metadata_values  Get the value(s) for metadata

Description
Extracts the values from the metadata annotations for the given property or properties, and returns the result.

Usage
get_metadata_values(nexml, annotated = NULL, props)

Arguments
nexml  a nexml object
annotated  the nexml component object from which to obtain metadata annotations, defaults to the nexml object itself
props  a character vector of property names for which to extract metadata annotations

Details
For matching property identifiers (i.e., URIs), prefixes in the input list as well as in the annotated object will be expanded using the namespaces of the nexml object. Names in the returned vector are mapped to the (possibly prefixed) form in the input list.

Value
a named character vector, giving the values and names being the property names

get_namespaces  get namespaces

Description
get namespaces

Usage
get_namespaces(nexml)

Arguments
nexml  a nexml object
**get_rdf**

Extract rdf-xml from a NeXML file

**Description**

Extract rdf-xml from a NeXML file

**Usage**

`get_rdf(file)`

**Arguments**

- `file` the name of a nxml file, or otherwise a nxml object.

**Value**

an RDF-XML object (XMLInternalDocument). This can be manipulated with tools from the XML R package, or converted into a triplestore for use with SPARQL queries from the rdflib R package.

---

**get_taxa**

**Description**

Retrieve names of all species/otus (operational taxonomic units) included in the nxml

**Usage**

`get_taxa(nxml)`

**Arguments**

- `nxml` a nxml object
Value

the list of taxa

See Also

get_item

Examples

comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nxml_read(comp_analysis)
get_taxa(nex)

get_taxa_list

Description

Retrieve names of all species/otus (operational taxonomic units) included in the nxml

Usage

get_taxa_list(nexml)

Arguments

nexml a nxml object

Value

the list of taxa

See Also

get_item
get_trees

**extract a phylogenetic tree from the nexml**

**Description**

extract a phylogenetic tree from the nexml

**Usage**

get_trees(nexml)

**Arguments**

nexml a representation of the nexml object from which the data is to be retrieved

**Value**

an ape::phylo tree, if only one tree is represented. Otherwise returns a list of lists of multiphylo trees. To consistently receive the list of lists format (preserving the hierarchical nature of the nexml), use `get_trees_list` instead.

**See Also**

get_trees get_flat_trees get_item

**Examples**

```r
comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nexml_read(comp_analysis)
get_trees(nex)
```

get_trees_list

**extract all phylogenetic trees in ape format**

**Description**

extract all phylogenetic trees in ape format

**Usage**

get_trees_list(nexml)

**Arguments**

nexml a representation of the nexml object from which the data is to be retrieved
Value

returns a list of lists of multiphylo trees, even if all trees are in the same trees node (and hence the outer list will be of length

1. or if there is only a single tree (and hence the inner list will also be of length 1. This ensures a consistent return type regardless of the number of trees present in the nexml file, and also preserves any grouping of trees.

See Also

get_trees get_flat_trees get_item

Examples

comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nexus_read(comp_analysis)
get_trees_list(nex)

Description

Compacts the list (i.e., removes NULL objects), then calls lapply() on the result with the remaining parameters.

Usage

lcapply(X, ...)

Arguments

X the list object
...
remaining arguments to lapply()
meta

Constructor function for metadata nodes

Description

Constructor function for metadata nodes

Usage

```r
meta(
  property = NULL,
  content = NULL,
  rel = NULL,
  href = NULL,
  datatype = NULL,
  id = NULL,
  type = NULL,
  children = list()
)
```

Arguments

- **property**: specify the ontological definition together with its namespace, e.g. `dc:title`
- **content**: content of the metadata field
- **rel**: Ontological definition of the reference provided in `href`
- **href**: A link to some reference
- **datatype**: optional RDFa field
- **id**: optional id element (otherwise id will be automatically generated).
- **type**: optional xsi:type. If not given, will use either "LiteralMeta" or "ResourceMeta" as determined by the presence of either a property or a href value.
- **children**: Optional element containing any valid XML block (XMLInternalElementNode class, see the XML package for details).

Details

User must either provide property+content or rel+href. Mixing these will result in potential garbage. The datatype attribute will be detected automatically from the class of the content argument. Maps from R class to schema datatypes are as follows: character - xs:string, Date - xs:date, integer - xs:integer, numeric - xs:decimal, logical - xs:boolean

See Also

- `nexml_write`

Examples

```r
meta(content="example", property="dc:title")
```
New

*new with namespaced class name*

Description

Convenience function for `methods::new()` that ensures that the provided class name is namespaced with a package name.

Usage

```r
New(Class, ...)
```

Arguments

- **Class**
  - the name of the S4 class to be instantiated
- **...**
  - additional parameters for `methods::new()`

Details

If the provided class name is not already namespaced (see `methods::packageSlot()`), it will be namespaced with this package. This mechanism is used by `new()` to disambiguate if the class name clashes with a class defined in another package.

Note

This may not completely eliminate messages on standard error about classes with the same name having been found in different packages. If they appear, they will most likely have come from the call to the `methods::initialize()` generic that `new()` issues at the end.

---

nexml-class

*Class representing a NeXML document*

Description

The `nexml` class represents a NeXML document, and is the top of the class hierarchy defined in this package, corresponding to the root node of the corresponding XML document.

Details

Normally objects of this type are created by the package as a result of reading a NeXML file, or of converting from another type, such as `ape::phylo`. Also, interacting directly with the slots of the class is normally not necessary. Instead, use the `get_XXX()` and `add_XXX()` functions in the API.
**nexml.tree**

**Slots**

- `trees` list, corresponding to the list of `<trees/>` elements in NeXML. Elements will be of class `trees`.
- `characters` list, corresponding to the list of `<characters/>` elements in NeXML. Elements will be of class `characters`.
- `otus` list, corresponding to the list of `<otus/>` elements in NeXML. Elements will be of class `otus`.
- `about` inherited, see `Annotated`
- `meta` inherited, see `Annotated`
- `xsi:type` for internal use
- `version` NeXML schema version, do not change
- `generator` name of software generating the XML
- `xsi:schemaLocation` for internal use, do not change
- `namespaces` named character vector giving the XML namespaces

**See Also**

- `read.nexml()`

**Examples**

```r
nex <- nexml() # a nexml object with no further content
nex <- new("nexml") # accomplishes the same thing
nex@generator
length(nex@trees)

data(bird.orders)
nex <- as(bird.orders, "nexml")
summary(nex)
length(nex@trees)
```

---

**nexml.tree**

*Constructor for the respective class*

**Description**

Creates an instance of the class corresponding to the respective NeXML element, and initializes its slots with the provided parameters, if any.

**Usage**

```r
nexml.tree(...)
nexml.trees(...)
nexml.node(...)
```
nexml.edge(...)  
nexml.otu(...)  
nexml.otus(...)  
nexml.char(...)  
nexml.characters(...)  
nexml.format(...)  
nexml.state(...)  
nexml.uncertain_state(...)  
nexml.states(...)  
nexml.uncertain_states(...)  
nexml.polymorphic_states(...)  
nexml.member(...)  
nexml.matrix(...)  
nexml.row(...)  
nexml.seq(...)  
nexml.cell(...)  

Arguments

... optionally, parameters passed on to new()

Details

Usually, users won’t need to invoke this directly.

See Also

nexml.meta() for documentation of nexml.meta()
Description

add elements to a new or existing nexml object

Usage

nexml_add(
  x,
  nexml = new("nexml"),
  type = c("trees", "characters", "meta", "namespaces"),
  ...
)

Arguments

x                     the object to be added
nexml                an existing nexml object onto which the object should be appended
type                 the type of object being provided.
...                   additional optional arguments to the add functions

Value

a nexml object with the additional data

See Also

add_trees add_characters add_meta add_namespaces

Examples

library("geiger")
data(geospiza)
geiger_nex <- nexml_add(geospiza$phy, type="trees")
geiger_nex <- nexml_add(geospiza$dat, nexml = geiger_nex, type="characters")
Publish NeXML to Figshare

**Description**

publish nexml to figshare

**Usage**

```r
description

nexml_figshare(nexml, 
    file = "nexml.xml", 
    categories = "Evolutionary Biology", 
    tags = list("phylogeny", "NeXML"), 
    visibility = c("public", "private", "draft"), 
    id = NULL, 
    ...
)
```

**Arguments**

- `nexml` a nexml object (or file path to a nexml file)
- `file` The filename desired for the object, if nexml is not already a file. if the first argument is already a path, this value is ignored.
- `categories` The figshare categories, must match available set. see `fs_add_categories`
- `tags` Any keyword tags you want to add to the data.
- `visibility` whether the results should be published (public), or kept private, or kept as a draft for further editing before publication. (New versions can be updated, but any former versions that was once made public will always be archived and cannot be removed).
- `id` an existing figshare id (e.g. from `fs_create`), to which this file can be appended.
- `...` additional arguments

**Value**

the figshare id of the object

**Examples**

```r
## Not run:
data(bird.orders)
birds <- add_trees(bird.orders)
doi <- nexml_figshare(birds, visibility = "public", repository="figshare")
```

## End(Not run)
Get the desired element from the nexml object

Description
Get the desired element from the nexml object

Usage
nexml_get(
  nexml,
  element = c("trees", "trees_list", "flat_trees", "metadata", "otu", "taxa",
               "characters", "characters_list", "namespaces"),
  ...
)

Arguments
nexml a nexml object (from read_nexml)

    element the kind of object desired, see details.

    ... additional arguments, if applicable to certain elements

Details

- "tree" an ape::phylo tree, if only one tree is represented. Otherwise returns a list of lists of multiphylo trees. To consistently receive the list of lists format (preserving the hierarchical nature of the nexml), use trees instead.
- "trees" returns a list of lists of multiphylo trees, even if all trees are in the same trees node (and hence the outer list will be of length 1) or if there is only a single tree (and hence the inner list will also be of length 1. This ensures a consistent return type regardless of the number of trees present in the nexml file, and also preserves any hierarchy/grouping of trees.
- "flat_trees" a multiPhylo object (list of ape::phylo objects) Note that this method collapses any hierarchical structure that may have been present as multiple trees nodes in the original nexml (though such a feature is rarely used). To preserve that structure, use trees instead.
- "metadata"Get metadata from the specified level (default is top/nexml level)
- "otu" returns a named character vector containing all available metadata. names indicate property (or rel in the case of links/resourceMeta), while values indicate the content (or href for links).
- "taxa" alias for otu

For a slightly cleaner interface, each of these elements is also defined as an S4 method for a nexml object. So in place of get_item(nexml,"tree"), one could use get_tree(nexml), and so forth for each element type.

Value
return type depends on the element requested. See details.
See Also

get_trees

Examples

```r
comp_analysis <- system.file("examples", "comp_analysis.xml", package="RNeXML")
nex <- nexml_read(comp_analysis)
nexml_get(nex, "trees")
nexml_get(nex, "characters_list")
```

```
nexml_publish  publish nexml files to the web and receive a DOI
```

Description

publish nexml files to the web and receive a DOI

Usage

```r
nexml_publish(nexml, ..., repository = "figshare")
```

Arguments

- `nexml`: a nexml object (or file path)
- `...`: additional arguments, depending on repository. See examples.
- `repository`: destination repository

Value

a digital object identifier to the published data

Examples

```r
## Not run:
data(bird.orders)
birds <- add_trees(bird.orders)
doi <- nexml_publish(birds, visibility = "public", repository="figshare")
## End(Not run)
```
nexml_read

Read NeXML files into various R formats

Description

Read NeXML files into various R formats

Usage

nexml_read(x, ...)

## S3 method for class 'character'
nexml_read(x, ...)

## S3 method for class 'XMLInternalDocument'
nexml_read(x, ...)

## S3 method for class 'XMLInternalNode'
nexml_read(x, ...)

Arguments

x Path to the file to be read in. An XML::XMLDocument-class or XMLNode-class

... Further arguments passed on to xmlTreeParse

Examples

# file
f <- system.file("examples", "trees.xml", package="RNeXML")
nexml_read(f)
## Not run: # may take > 5 s
# url
url <- "https://raw.githubusercontent.com/ropensci/RNeXML/master/inst/examples/trees.xml"
nexml_read(url)
# character string of XML
str <- paste0(readLines(f), collapse = "")
nexml_read(str)
# XMLInternalDocument
library("httr")
library("XML")
x <- xmlParse(content(GET(url)))
nexml_read(x)
# XMLInternalNode
nexml_read(xmlRoot(x))

## End(Not run)
nexml_validate

validate nexml using the online validator tool

Description

validate nexml using the online validator tool

Usage

nexml_validate(file, schema = CANONICAL_SCHEMA)

Arguments

file
path to the nexml file to validate

schema
URL of schema (for fallback method only, set by default).

Details

Requires an internet connection. see http://www.nexml.org/nexml/phylows/validator for more information in debugging invalid files

Value

TRUE if the file is valid, FALSE or error message otherwise

Examples

## Not run:
data(bird.orders)
birds <- nexml_write(bird.orders, "birds_orders.xml")
nexml_validate("birds_orders.xml")
unlink("birds_orders.xml") # delete file to clean up

## End(Not run)

nexml_write

Write nexml files

Description

Write nexml files
Usage

nexml_write(
  x = nexml(),
  file = NULL,
  trees = NULL,
  characters = NULL,
  meta = NULL,
  ...
)

Arguments

- **x**: a nexml object, or any phylogeny object (e.g. phylo, phylo4) that can be coerced into one. Can also be omitted, in which case a new nexml object will be constructed with the additional parameters specified.
- **file**: the name of the file to write out
- **trees**: phylogenetic trees to add to the nexml file (if not already given in x) see add_trees for details.
- **characters**: additional characters
- **meta**: A meta element or list of meta elements, see add_meta
- **...**: additional arguments to add_basic_meta, such as the title. See add_basic_meta.

Value

Writes out a nexml file

See Also

- add_trees
- add_characters
- add_meta
- nexml_read

Examples

```r
## Write an ape tree to nexml, analogous to write.nexus:
library(ape); data(bird.orders)
ex <- tempfile(fileext=".xml")
write.nexml(bird.orders, file = ex)

## Not run: # takes > 5s
## Assemble a nexml section by section and then write to file:
library(geiger)
data(geospiza)

nexml <- add_trees(geospiza$phy) # creates new nexml
exml <- add_characters(geospiza$dat, nexml = nexml) # pass the nexml obj to append character data
nexml <- add_basic_meta(title="my title", creator = "Carl Boettiger", nexml = nexml)
exml <- add_meta(meta("prism:modificationDate", format(Sys.Date())), nexml = nexml)

ex <- tempfile(fileext=".xml")
write.nexml(nexml, file = ex)
```
simmap_to_nexml

## As above, but in one call (except for add_meta() call).
write.nexml(trees = geospiza$phy,
            characters = geospiza$dat,
            title = "My title",
            creator = "Carl Boettiger",
            file = ex)

## Mix and match: identical to the section by section:
nexml <- add_meta(meta("prism:modificationDate", format(Sys.Date())))
write.nexml(x = nexml,
           trees = geospiza$phy,
           characters = geospiza$dat,
           title = "My title",
           creator = "Carl Boettiger",
           file = ex)

## End(Not run)

reset_id_counter

### Description
reset the id counter

### Usage
reset_id_counter()

simmap_to_nexml

### Convert phylo with attached simmap to nexml object

### Description
Convert phylo with attached simmap to nexml object
Convert nexml object with simmap to phylo

### Usage
simmap_to_nexml(phy, state_ids = NULL)
nexml_to_simmap(nexml)
Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>phy</td>
<td>a phylo object containing simmap phy$maps element, from the phytools package</td>
</tr>
<tr>
<td>state_ids</td>
<td>a named character vector giving the state names corresponding to the ids used to refer to each state in nexml. If null ids will be generated and states taken from the phy$states names.</td>
</tr>
<tr>
<td>nexml</td>
<td>a nexml object</td>
</tr>
</tbody>
</table>

Value

- a nexml representation of the simmap
- a simmap object (phylo object with a $maps element for use in phytools functions).

Functions

- `nexml_to_simmap`: Convert nexml object with simmap to phylo

Examples

```r
simmap_ex <- read.nexml(system.file("examples","simmap_ex.xml", package="RNeXML"))
phy <- nexml_to_simmap(simmap_ex)
nex <- simmap_to_nexml(phy)
```

Description

See `methods::slot()`. This version allows using "property" consistently for both LiteralMeta and ResourceMeta (which internally uses "rel" because RDFa does), which is easier to program. It also allows using "meta" as an alias for "children" for ResourceMeta, to be consistent with the corresponding slot for instances of Annotated.

Usage

```r
## S4 method for signature 'ResourceMeta'
slot(object, name)

## S4 replacement method for signature 'ResourceMeta'
slot(object, name) <- value
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object</td>
<td>the object</td>
</tr>
<tr>
<td>name</td>
<td>name of the slot</td>
</tr>
<tr>
<td>value</td>
<td>the new value</td>
</tr>
</tbody>
</table>
**summary.nexml-method**

**Description**

Generates a list of various counts of the major elements that comprise a `nexml` object, such as number of different kinds of blocks, characters, states, OTUs (taxa), etc.

**Usage**

```r
## S4 method for signature 'nexml'
summary(object)
```

**Arguments**

- `object` the `nexml` object

**Details**

The `show` method uses this summary for pretty-printing a summary of the NeXML object, but it can be used on its own as well, in particular for quick inspection of key properties of a NeXML file.

**Value**

A list with the following elements:

- `nblocks` the number of trees, otus, and characters blocks
- `ncharacters` the number of characters in each characters block
- `nstates` summary statistics of the number of character states per state set defined for each characters block
- `nnonstdstate` the number of polymorphic and uncertain states defined for each character block
- `nmatrixrows` the number of rows in the matrix for each character block
- `ntrees` the number of trees contained in each trees block
- `notus` the number of OTUs defined in each OTUs block
- `nmeta` a list of the number of the number of metadata annotations at several levels, specifically:
  - `nexml` at the top (nexml) level
  - `otu` at the OTU level, for each OTUs block
  - `char` at the character level, for each characters block
  - `state` at the character state level, for each characters block

**See Also**

`methods::slot()`
Examples

```r
tex <- nexml_read(system.file("examples", "comp_analysis.xml", package = "RNeXML"))
s <- summary(tex)
# number of major blocks:
s$nblocks

# each characters block defines 1 character:
s$ncharacters

# summary stats of states per character (for morphological matrices there is
# typically one state set per character)
s$nstates # note that first block is of continuous type, so no stats there

# pretty-printed summary:
tex # this is the same as show(tex)
```

taxize_nexml  
taxize nexml

Description

Check taxonomic names against the specified service and add appropriate semantic metadata to the
nexml OTU unit containing the corresponding identifier.

Usage

```r
taxize_nexml(
  nexml,  
  type = c("ncbi", "itis", "col", "tpl", "gbif", "wd"),
  warnings = TRUE,
  ...)
```

Arguments

- `nexml`: a nexml object
- `type`: the name of the identifier to use
- `warnings`: should we show warning messages if no match can be found?
- `...`: additional arguments to [taxadb::get_ids()]

Examples

```r
## Not run:
data(bird.orders)
birds <- add_trees(bird.orders)
birds <- taxize_nexml(birds, "NCBI")

## End(Not run)
```
toPhylo

**Description**
	nexml to phylo coercion

**Usage**

toPhylo(tree, otus)

**Arguments**

- **tree**: an nexml tree element
- **otus**: a character string of taxonomic labels, named by the otu ids. e.g. (from get_otu_maps for the otus set matching the relevant trees node.

**Value**

phylo object. If a "reconstructions" annotation is found on the edges, return simmap maps slot as well.
Index

 cashGeneric, 3
.methodWithNext, 4
.sigLabel, 5

add_basic_meta, 5, 8, 39
add_characters, 6, 7, 8, 33, 39
add_meta, 6, 8, 33, 39
add_meta(), 9
add_namespaces, 9, 33
add_trees, 6, 8, 10, 33, 39
Annotated, 31
Annotated-class, 11

c,ListOfmeta-method(c,meta-method), 11
c,meta-method, 11
c,nexml-method, 12
c-ListOfmeta(c,meta-method), 11
c-meta (c,meta-method), 11
charzero_as_empty, 12
coaalesce, 13
dplyr::coalesce(), 13
expand_prefix, 13
findNextMethod, 15
flatten_multiphylo, 16

get_all_meta, 16
get_characters, 17
get_characters_list, 18
get_citation, 19
get_flat_trees, 20, 27, 28
get_item, 20, 26–28
get_item(nexml-get), 35
get_level, 20
get_license, 21
get_meta, 22
get_metadata, 23
get_metadata_values, 24
get_metadata_values(), 19, 22
get_namespaces, 24
get_namespaces(), 9
get_otu(get_taxa), 25
get_otus_list(get_taxa_list), 26
get_rdf, 25
get_taxa, 25
get_taxa_list, 26
get_trees, 20, 27, 28, 36
get_trees_list, 27, 27
lapply(), 28
lapply, 28
list, 11
meta, 8, 11, 29
meta(), 9
methods::new(), 30
methods::slot(), 41, 42

New, 30
new(), 32
nexml, 42
nexml (nexml-class), 30
nexml-class, 30
nexml.cell (nexml.tree), 31
nexml.char (nexml.tree), 31
nexml.characters (nexml.tree), 31
nexml.edge (nexml.tree), 31
nexml.format (nexml.tree), 31
nexml.matrix (nexml.tree), 31
nexml.member (nexml.tree), 31
nexml.meta (meta), 29
nexml.meta(), 32
nexml.meta_ (nexml.tree), 31
nexml.node (nexml.tree), 31
nexml.otu (nexml.tree), 31
nexml.otus (nexml.tree), 31
nexml.polymorphic_states (nexml.tree), 31
nexml.row (nexml.tree), 31

45
nxml.seq(nxml.tree), 31
nxml.state(nxml.tree), 31
nxml.states(nxml.tree), 31
nxml.tree, 31
nxml.trees(nxml.tree), 31
nxml.uncertain_state(nxml.tree), 31
nxml.uncertain_states(nxml.tree), 31
nxml_add, 33
nxml_figshare, 34
nxml_get, 35
nxml_publish, 36
nxml_read, 37, 39
nxml_to_simmap(simmap_to_nexml), 40
nxml_validate, 38
nxml_write, 29, 38
read.nexml, 12
read.nexml(nxml_read), 37
read.nexml(), 31
reset_id_counter, 40
show, 42
simmap_to_nexml, 40
slot,ResourceMeta-method, 41
slot-ResourceMeta-method
(slot,ResourceMeta-method), 41
slot<-,ResourceMeta-method
(slot,ResourceMeta-method), 41
summary,nexml-method, 42
summary.nexml(summary,nexml-method), 42
taxize_nexml, 43
toPhylo, 44
write.nexml, 12
write.nexml(nxml_write), 38
xmlTreeParse, 37