

S1 Appendix. Clavis JSON-schema

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "title": "Clavis identification key schema",
  "description": "Clavis-compliant keys contain knowledge that may be
used to distinguish taxa from each other.",
  "type": "object",
  "required": [
    "$schema",
    "title",
    "language",
    "license",
    "creator",
    "lastModified",
    "identifier",
    "taxa",
    "characters",
    "statements"
  ],
  "properties": {
    "$schema": {
      "description": "The schema url of (this) schema defining the
format of the key.",
      "$ref": "#/definitions/url"
    },
    "title": {
      "description": "The name of the key",
      "comment": "Accepts array for multilingual support.",
      "$ref": "#/definitions/localizedString",
      "examples": [
        "Birds of Norway"
      ]
    },
    "media": {
      "description": "The logo/illustration image of the key.",
      "$ref": "#/definitions/mediaID"
    },
    "description": {
      "description": "Short description of the key (valid markdown).",
      "comment": "Accepts array for multilingual support.",
      "$ref": "#/definitions/localizedString",
      "contentMediaType": "text/markdown"
    },
    "descriptionDetails": {
      "description": "Extended description of the key that supplements
the description (valid markdown).",
      "comment": "Accepts array for multilingual support.",

```

```

        "$ref": "#/definitions/localizedString",
        "contentMediaType": "text/markdown"
    },
    "descriptionUrl": {
        "description": "Hyperlink to more information on the key (valid
url).",
        "comment": "Accepts array for multilingual support.",
        "$ref": "#/definitions/localizedUrl"
    },
    "audience": {
        "description": "Description of the intended audience for the
key.",
        "comment": "Accepts array for multilingual support.",
        "$ref": "#/definitions/localizedString",
        "examples": [
            "Undergraduate students and up."
        ]
    },
    "source": {
        "description": "Source of the key.",
        "comment": "Accepts array for multilingual support.",
        "$ref": "#/definitions/localizedString",
        "examples": [
            "Koch, Wouter (2019). Birds of Norway. ISBN 1234567890"
        ]
    },
    "sourceUrl": {
        "description": "Hyperlink to the source of the key (valid url).",
        "comment": "Accepts array for multilingual support.",
        "$ref": "#/definitions/localizedUrl",
        "examples": [
            "https://doi.org/10.1126/science.1251554"
        ]
    },
    "regionName": {
        "description": "The name of the region for which the key is valid
(e.g. covers all subtaxa).",
        "comment": "Accepts array for multilingual support.",
        "$ref": "#/definitions/localizedString",
        "examples": [
            "Norway",
            "Europe",
            "Trøndelag",
            [
                "Norge",
                "Norway"
            ]
        ]
    },
    "geography": {
        "description": "The region for which the key is valid (e.g. covers
all subtaxa), represented as the coordinates array of a GeoJSON

```

```

MultiPolygon.",
    "$ref": "#/definitions/multiPolygon"
  },
  "primaryContact": {
    "description": "The organization- or person-id that is the main
contact point for the key.",
    "oneOf": [
      {
        "$ref": "#/definitions/personID"
      },
      {
        "$ref": "#/definitions/organizationID"
      }
    ]
  },
  "creator": {
    "description": "The id(s) of the creator(s) of the key",
    "oneOf": [
      {
        "$ref": "#/definitions/personID"
      },
      {
        "type": "array",
        "items": {
          "$ref": "#/definitions/personID"
        }
      }
    ]
  },
  "contributor": {
    "description": "The id(s) of the contributor(s) of the key",
    "oneOf": [
      {
        "$ref": "#/definitions/personID"
      },
      {
        "type": "array",
        "items": {
          "$ref": "#/definitions/personID"
        }
      }
    ]
  },
  "publisher": {
    "description": "The id(s) of the publishing institutions of the
key.",
    "oneOf": [
      {
        "$ref": "#/definitions/organizationID"
      },
      {
        "type": "array",

```

```

        "items": {
            "$ref": "#/definitions/organizationID"
        }
    ],
    },
    "license": {
        "description": "The url to the license under which the key
falls.",
        "$ref": "#/definitions/url",
        "examples": [
            "https://creativecommons.org/licenses/by/4.0/"
        ]
    },
    "language": {
        "description": "The ISO 639-1 code(s) of the key language(s).",
        "comment": "String for a single language, array of strings for
multilingual support. If used as an array, be sure to use the
localizedString and localizedUrl as arrays too.",
        "oneOf": [
            {
                "type": "string",
                "pattern": "^[a-z]{2}$"
            },
            {
                "type": "array",
                "items": {
                    "type": "string",
                    "pattern": "^[a-z]{2}$"
                }
            }
        ],
        "examples": [
            "en",
            "nb",
            [
                "en",
                "nb"
            ]
        ]
    },
    "created": {
        "description": "The moment the key was made or first published, as
'YYYY-MM-DD hh:mm:ss'.",
        "type": "string",
        "pattern": "^20\\d\\d-(0[1-9]|1[0-2])-(012\\d|3[01])
(01\\d|2[0-3]):([0-5]\\d):([0-5]\\d)$",
        "examples": [
            "2019-05-21 22:51:55"
        ]
    },
    "lastModified": {

```

```

        "description": "The most recent moment the key was modified, as
'YYYY-MM-DD hh:mm:ss'.",
        "type": "string",
        "pattern": "^20\\d\\d-(0[1-9]|1[0-2])-(012\\d|3[01])
([01]\\d|2[0-3]):([0-5]\\d):([0-5]\\d)$",
        "examples": [
            "2019-05-21 22:51:55"
        ]
    },
    "identifier": {
        "description": "The GUID of this key (persistent regardless of
version).",
        "type": "string"
    },
    "url": {
        "description": "The url of where the key lives (to check for newer
versions).",
        "$ref": "#/definitions/url"
    },
    "externalServices": {
        "description": "Services used by the key for lookups of images,
taxa, etc.",
        "type": "array",
        "items": {
            "$ref": "#/definitions/externalService"
        }
    },
    "userRequirements": {
        "description": "Requirements to the users of the various
characters, so that the user can be warned, helped, etc.",
        "type": "array",
        "items": {
            "$ref": "#/definitions/userRequirement"
        }
    },
    "taxa": {
        "description": "Taxa (e.g. species) the key can resolve to. Do not
have to be exclusively taxonomic units.",
        "comment": "Taxa to which the key can resolve. Either the taxa
directly or their children. SubTaxonomic taxa (such as morphs, genders,
life stages) should be presented through their parent only.",
        "type": "array",
        "items": {
            "$ref": "#/definitions/taxon"
        }
    },
    "characters": {
        "description": "Characters (questions, e.g. 'Wing color' or
'Number of spots') used to distinguish between two or more taxa.",
        "type": "array",
        "items": {
            "$ref": "#/definitions/character"
        }
    }

```

```

    }
  },
  "statements": {
    "description": "Relationships between taxa and character states
(or lack thereof) that define those taxa.",
    "type": "array",
    "items": {
      "$ref": "#/definitions/statement"
    }
  },
  "persons": {
    "description": "Persons that are connected to (parts of) the key,
such as creators.",
    "type": "array",
    "items": {
      "$ref": "#/definitions/person"
    }
  },
  "organizations": {
    "description": "Organizations that are connected to (parts of) the
key or persons, such as employers and publishers.",
    "type": "array",
    "items": {
      "$ref": "#/definitions/organization"
    }
  },
  "mediaElements": {
    "description": "Media elements that are used in the key.",
    "type": "array",
    "items": {
      "$ref": "#/definitions/localizedMediaElement"
    }
  },
  "definitions": {
    "localizedString": {
      "description": "Language-dependent string or object of strings,
with keys corresponding to the languages supported by the key.",
      "oneOf": [
        {
          "type": "string"
        },
        {
          "type": "object",
          "propertyNames": {
            "pattern": "^[a-z]{2}$"
          },
          "properties": {},
          "additionalProperties": {
            "type": "string"
          }
        }
      ]
    }
  }
}

```

```

    ]
  },
  "localizedUrl": {
    "description": "Language-dependent urls or object of urls,
corresponding to the languages supported by the key.",
    "oneOf": [
      {
        "$ref": "#/definitions/url"
      },
      {
        "type": "object",
        "propertyNames": {
          "pattern": "^[a-z]{2}$"
        },
        "properties": {},
        "additionalProperties": {
          "$ref": "#/definitions/url"
        }
      }
    ]
  },
  "localizedMediaElement": {
    "type": "object",
    "description": "Language-dependent media element or object of
media elements, corresponding to the languages supported by the key.",
    "properties": {
      "id": {
        "description": "Internally unique id of the localized media
element.",
        "$ref": "#/definitions/mediaID"
      },
      "mediaElement": {
        "description": "The media element or media elements (one for
each language).",
        "oneOf": [
          {
            "$ref": "#/definitions/mediaElement"
          },
          {
            "type": "object",
            "propertyNames": {
              "pattern": "^[a-z]{2}$"
            },
            "properties": {},
            "additionalProperties": {
              "$ref": "#/definitions/mediaElement"
            }
          }
        ]
      }
    }
  },
},

```

```

"url": {
  "description": "String formed as a url, or an external
resource.",
  "oneOf": [
    {
      "type": "string",
      "format": "uri"
    },
    {
      "$ref": "#/definitions/externalResource"
    }
  ]
},
"taxonID": {
  "description": "String used as an internal ID for a taxon.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^taxon:[a-z0-9_]+$"
},
"characterID": {
  "description": "String used as an internal ID for a character.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^character:[a-z0-9_]+$"
},
"stateID": {
  "description": "String used as an internal ID for a state.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^state:[a-z0-9_]+$"
},
"personID": {
  "description": "String used as an internal ID for a person.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^person:[a-z0-9_]+$"
},
"organizationID": {
  "description": "String used as an internal ID for an organization.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^organization:[a-z0-9_]+$"
},
"serviceID": {
  "description": "String used as an internal ID for a service.
Lowercase alphanumerical and underscores are allowed.",
  "type": "string",
  "pattern": "^service:[a-z0-9_]+$"
},
"statementID": {
  "description": "String used as an internal ID for a statement.
Lowercase alphanumerical and underscores are allowed.",

```



```

        "type": "string",
        "pattern": "^statement:[a-z0-9_]+$"
    },
    "userRequirementID": {
        "description": "String used as an internal ID for a user
requirement. Lowercase alphanumerical and underscores are allowed.",
        "type": "string",
        "pattern": "^requirement:[a-z0-9_]+$"
    },
    "mediaID": {
        "description": "String used as an internal ID for a media element.
Lowercase alphanumerical and underscores are allowed.",
        "type": "string",
        "pattern": "^media:[a-z0-9_]+$"
    },
    "mediaFile": {
        "type": "object",
        "properties": {
            "title": {
                "description": "The title of the media file.",
                "$ref": "#/definitions/localizedString"
            },
            "url": {
                "description": "The reference to the media file (url or
resource).",
                "$ref": "#/definitions/url"
            },
            "file": {
                "description": "The actual media file (base64 or svg) as a
data URI scheme.",
                "oneOf": [
                    {
                        "type": "string",
                        "pattern": "^data:([a-z0-9/]+);base64,([a-zA-Z0-9+/=]+)$"
                    },
                    {
                        "type": "string",
                        "pattern": "^data:image/svg+xml;utf8,(.*)$"
                    }
                ]
            },
            "width": {
                "description": "The number of pixels horizontally (if a bitmap
image or video).",
                "type": "integer"
            },
            "height": {
                "description": "The number of pixels vertically (if a bitmap
image or video).",
                "type": "integer"
            },
            "length": {

```

```

        "description": "The length in seconds of an audio or video
file.",
        "type": "integer"
    },
    "placeholder": {
        "description": "Image file that can be shown instead of the
video or audio file.",
        "$ref": "#/definitions/mediaID"
    },
    "creator": {
        "description": "The id(s) of the creator(s) of the media
file",
        "oneOf": [
            {
                "$ref": "#/definitions/personID"
            },
            {
                "type": "array",
                "items": {
                    "$ref": "#/definitions/personID"
                }
            }
        ]
    },
    "contributor": {
        "description": "The id(s) of the contributor(s) of the media
file",
        "oneOf": [
            {
                "$ref": "#/definitions/personID"
            },
            {
                "type": "array",
                "items": {
                    "$ref": "#/definitions/personID"
                }
            }
        ]
    },
    "publisher": {
        "description": "The id(s) of the publishing institutions of the
media file.",
        "oneOf": [
            {
                "$ref": "#/definitions/organizationID"
            },
            {
                "type": "array",
                "items": {
                    "$ref": "#/definitions/organizationID"
                }
            }
        ]
    }
}

```

```

    ]
  },
  "license": {
    "description": "The url to the license under which the media
file falls.",
    "$ref": "#/definitions/url",
    "examples": [
      "https://creativecommons.org/licenses/by/4.0/"
    ]
  }
},
"mediaElement": {
  "description": "A media element (collection of various formats of
the same media object).",
  "type": "object",
  "properties": {
    "file": {
      "description": "The various formats of the same media
object.",
      "oneOf": [
        {
          "$ref": "#/definitions/mediaFile"
        },
        {
          "type": "array",
          "items": {
            "$ref": "#/definitions/mediaFile"
          }
        }
      ]
    }
  }
},
"multiPolygon": {
  "description": "The coordinates array of a GeoJSON
MultiPolygon.",
  "type": "array",
  "items": {
    "type": "array",
    "items": {
      "type": "array",
      "items": {
        "type": "array",
        "items": {
          "type": "number"
        }
      }
    }
  }
},
"externalResource": {

```

515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566

```

        "description": "A resource managed elsewhere.",
        "type": "object",
        "properties": {
            "serviceId": {
                "description": "The id to one of the externalServices
defined.",
                "$ref": "#/definitions/serviceID"
            },
            "externalId": {
                "description": "The id of the resource at the
externalService.",
                "type": "string"
            }
        },
        "externalService": {
            "description": "Service used by the key, for media files, taxonomy
and/or nomenclature, species distributions, etc.",
            "type": "object",
            "required": [
                "id"
            ],
            "properties": {
                "id": {
                    "description": "Internally unique id to the service.",
                    "$ref": "#/definitions/serviceID"
                },
                "title": {
                    "description": "Name of the service.",
                    "type": "string"
                },
                "provider": {
                    "description": "Provider of the service.",
                    "type": "string"
                },
                "url": {
                    "description": "Url for the service documentation.",
                    "$ref": "#/definitions/url"
                }
            }
        },
        "person": {
            "type": "object",
            "required": [
                "id",
                "name"
            ],
            "properties": {
                "id": {
                    "$ref": "#/definitions/personID"
                },
                "name": {

```

```

        "description": "Full name of the person",
        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/localizedString"
    },
    "email": {
        "description": "Email address of the person",
        "type": "string",
        "format": "email"
    },
    "url": {
        "description": "Hyperlink to more information on the person
(valid url).",
        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/localizedUrl"
    },
    "media": {
        "description": "A media file (image) representing the
person.",
        "$ref": "#/definitions/mediaID"
    },
    "affiliation": {
        "description": "Organization id(s) the person is affiliated
with.",
        "oneOf": [
            {
                "$ref": "#/definitions/organizationID"
            },
            {
                "type": "array",
                "items": {
                    "$ref": "#/definitions/organizationID"
                }
            }
        ]
    },
    "organization": {
        "type": "object",
        "required": [
            "id",
            "name"
        ],
        "properties": {
            "id": {
                "$ref": "#/definitions/organizationID"
            },
            "name": {
                "description": "Name of the organization",
                "comment": "Accepts object for multilingual support.",
                "$ref": "#/definitions/localizedString"
            },

```

619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670

```

        "url": {
            "description": "Hyperlink to more information on the
organization (valid url).",
            "comment": "Accepts object for multilingual support.",
            "$ref": "#/definitions/localizedUrl"
        },
        "primaryContact": {
            "description": "The person-id that is the main contact point
for the organization.",
            "$ref": "#/definitions/personID"
        },
        "media": {
            "description": "A media file (image) representing the
organization, such as a logo.",
            "$ref": "#/definitions/mediaID"
        }
    },
    "userRequirement": {
        "type": "object",
        "required": [
            "id"
        ],
        "properties": {
            "id": {
                "$ref": "#/definitions/userRequirementID"
            },
            "title": {
                "comment": "Accepts array for multilingual support.",
                "$ref": "#/definitions/localizedString"
            },
            "warning": {
                "comment": "Accepts array for multilingual support.",
                "$ref": "#/definitions/localizedString"
            },
            "description": {
                "description": "Short description of the requirements to the
user (valid markdown).",
                "comment": "Accepts object for multilingual support.",
                "$ref": "#/definitions/localizedString",
                "contentMediaType": "text/markdown"
            },
            "descriptionDetails": {
                "description": "Extended description of the requirements to
the user that supplements the description (valid markdown).",
                "comment": "Accepts object for multilingual support.",
                "$ref": "#/definitions/localizedString",
                "contentMediaType": "text/markdown"
            },
            "descriptionUrl": {
                "description": "Hyperlink to more information on the
requirements to the user (valid url).",

```

```

        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/localizedUrl"
    },
    "media": {
        "description": "Media or illustration that informs the user on
the requirements to the user.",
        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/mediaID"
    }
},
"taxon": {
    "type": "object",
    "oneOf": [
        {
            "required": [
                "id",
                "scientificName"
            ]
        },
        {
            "required": [
                "id",
                "externalReference"
            ]
        },
        {
            "required": [
                "id",
                "label"
            ]
        }
    ],
    "properties": {
        "id": {
            "description": "Internally unique id to the taxon.",
            "$ref": "#/definitions/taxonID"
        },
        "scientificName": {
            "description": "Scientific name of the taxon.",
            "minLength": 5,
            "type": "string",
            "examples": [
                "Vulpes lagopus"
            ]
        },
        "scientificNameAuthor": {
            "description": "Author string of the scientific name of the
taxon.",
            "type": "string",
            "examples": [
                "Koch, 1888"
            ]
        }
    }
}

```

```

    ]
  },
  "placeholderName": {
    "description": "Name that can be shown while fetching the name
externally. Also useful for editing the key.",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "examples": [
      "B. hortorum (melanistic queen)"
    ]
  },
  "vernacularName": {
    "description": "Vernacular name of the taxon.",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "examples": [
      "fjellrev",
      {
        "no": "fjellrev",
        "en": "Arctic Fox"
      }
    ]
  },
  "media": {
    "description": "Media elements of the taxon.",
    "oneOf": [
      {
        "$ref": "#/definitions/mediaID"
      },
      {
        "type": "array",
        "items": {
          "$ref": "#/definitions/mediaID"
        }
      }
    ]
  },
  "description": {
    "description": "Short description of the taxon (valid
markdown).",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "contentMediaType": "text/markdown"
  },
  "descriptionDetails": {
    "description": "Extended description of the taxon that
supplements the description (valid markdown).",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "contentMediaType": "text/markdown"
  },
  "descriptionUrl": {

```



```

        "description": "Hyperlink or resource to more information on
the taxon.",
        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/localizedUrl"
    },
    "rank": {
        "description": "Name of the level of the taxon.",
        "comment": "Accepts object for multilingual support.",
        "$ref": "#/definitions/localizedString",
        "examples": [
            "slekt",
            {
                "no": "slekt",
                "en": "genus"
            }
        ]
    },
    "label": {
        "description": "Type of morph of the taxon.",
        "type": "string",
        "minLength": 0,
        "examples": [
            "male",
            "♀",
            "larva"
        ]
    },
    "isEndPoint": {
        "description": "Whether the key should stop when this taxon is
the only remaining possibility, even when it has multiple children
remaining.",
        "comment": "Default is FALSE (if not specified). A taxon
without children is alway an endpoint by definition, unless one of its
ancestors overrides this by being specified as an endpoint.",
        "type": "boolean"
    },
    "children": {
        "type": "array",
        "items": {
            "$ref": "#/definitions/taxon"
        }
    },
    "externalReference": {
        "description": "Reference to a taxon at a provider, as an
object wiht a provider id and a taxon id at that provider.",
        "comment": "Accepts object for multilingual support.",
        "oneOf": [
            {
                "$ref": "#/definitions/externalResource"
            },
            {
                "type": "object",

```

```

        "propertyNames": {
            "pattern": "~[a-z]{2}$"
        },
        "properties": {},
        "additionalProperties": {
            "$ref": "#/definitions/externalResource"
        }
    }
],
},
"followUp": {
    "description": "Url or reference to instance at external
service for a key for this taxon, that for instance can be used to
identify to a lower rank than the current key can.",
    "comment": "Accepts array for multilingual support.",
    "$ref": "#/definitions/localizedUrl"
},
"geography": {
    "description": "The area(s) in which the taxon occurs,
represented as the coordinates array of a GeoJSON MultiPolygon.",
    "$ref": "#/definitions/multiPolygon"
},
"geographyService": {
    "description": "An url or external service that returns
distribution information for this taxon.",
    "$ref": "#/definitions/url"
}
},
"character": {
    "type": "object",
    "required": [
        "id",
        "title",
        "states"
    ],
    "properties": {
        "id": {
            "description": "Internally unique id to the character.",
            "$ref": "#/definitions/characterID"
        },
        "title": {
            "description": "Name of the character.",
            "comment": "Accepts array for multilingual support.",
            "$ref": "#/definitions/localizedString",
            "examples": [
                "Color of the wings"
            ]
        },
        "media": {
            "description": "The media element(s) of the character. Can be
used to inform user of relevant structures etc.",

```

```

"oneOf": [
  {
    "$ref": "#/definitions/mediaID"
  },
  {
    "type": "array",
    "items": {
      "$ref": "#/definitions/mediaID"
    }
  }
],
"description": {
  "description": "Short description of the character (valid
markdown).",
  "comment": "Accepts object for multilingual support.",
  "$ref": "#/definitions/LocalizedString",
  "contentMediaType": "text/markdown"
},
"descriptionDetails": {
  "description": "Extended description of the character that
supplements the description (valid markdown).",
  "comment": "Accepts object for multilingual support.",
  "$ref": "#/definitions/LocalizedString",
  "contentMediaType": "text/markdown"
},
"descriptionUrl": {
  "description": "Hyperlink or resource to more information on
the character.",
  "comment": "Accepts object for multilingual support.",
  "$ref": "#/definitions/LocalizedUrl"
},
"type": {
  "description": "Type of the character (exclusive when states
are catagorical and mutually exclusive, non-exclusive when these are
non-exclusive, or numerical when the state is numerical).",
  "comment": "Default is exclusive (if not specified).",
  "type": "string",
  "enum": [
    "exclusive",
    "non-exclusive",
    "numerical"
  ]
},
"userRequirement": {
  "description": "Id to the userRequirement required to answer
this character.",
  "comment": "Has to be one of the userRequirement defined on
the key level.",
  "$ref": "#/definitions/userRequirementID"
},
"logicalPremise": {

```

```

        "description": "Logical requirement that has to be fulfilled
for this question to be asked.",
        "comment": "Has to refer to stateIds, that have to be fully
true (either answered or all alternatives ruled out). Can use !, &&, ||,
(, ), <, >, =.",
        "type": "string",
        "pattern": "^( ( && ) | ( \\|\\|
) | ( && ) | ( \\|\\| ) | [a-z0-9_:(!<>=)] + $"
    },
    "states": {
        "oneOf": [
            {
                "type": "array",
                "items": {
                    "$ref": "#/definitions/state"
                }
            },
            {
                "$ref": "#/definitions/state"
            }
        ]
    }
},
"state": {
    "description": "The value a character can have.",
    "type": "object",
    "oneOf": [
        {
            "required": [
                "id",
                "title"
            ]
        },
        {
            "required": [
                "id",
                "min",
                "max",
                "stepSize",
                "unit"
            ]
        }
    ],
    "properties": {
        "id": {
            "description": "Internally unique id of the state.",
            "$ref": "#/definitions/stateID"
        },
        "title": {
            "description": "Content of the state.",
            "comment": "Only to be used for catergorical characters."
        }
    }
}

```

```

Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString"
},
"media": {
    "description": "Media element(s) that illustrate the state.",
    "oneOf": [
        {
            "$ref": "#/definitions/mediaID"
        },
        {
            "type": "array",
            "items": {
                "$ref": "#/definitions/mediaID"
            }
        }
    ]
},
"description": {
    "description": "Short description of the state (valid
markdown).",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "contentMediaType": "text/markdown"
},
"descriptionDetails": {
    "description": "Extended description of the state that
supplements the description (valid markdown).",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "contentMediaType": "text/markdown"
},
"descriptionUrl": {
    "description": "Hyperlink or resource to more information on
the state.",
    "comment": "Accepts object for multilingual support.",
    "$ref": "#/definitions/localizedUrl"
},
"min": {
    "description": "Lowest numerical value of the state (over all
taxa).",
    "comment": "Only to be used for numerical characters",
    "type": "number"
},
"max": {
    "description": "Highest possible numerical value of the state
(over all taxa).",
    "comment": "Only to be used for numerical characters",
    "type": "number"
},
"stepSize": {
    "description": "Step size of the state (steps between min and
max, over all taxa).",

```

```

        "comment": "Only to be used for numerical characters",
        "type": "number"
    },
    "unit": {
        "description": "Unit in which the state is measured or
counted.",
        "comment": "Only to be used for numerical characters. Accepts
object for multilingual support.",
        "$ref": "#/definitions/localizedString",
        "examples": [
            "mm",
            "meters below the surface",
            "spots",
            "legs",
            "kg"
        ]
    }
},
"statement": {
    "description": "A fact connecting a taxon and a character through
a certain value.",
    "type": "object",
    "required": [
        "id",
        "taxonId",
        "characterId",
        "value",
        "frequency"
    ],
    "properties": {
        "id": {
            "description": "Internally unique id of the statement.",
            "$ref": "#/definitions/statementID"
        },
        "taxon": {
            "description": "Id of the taxon this statement is about.",
            "$ref": "#/definitions/taxonID"
        },
        "character": {
            "description": "Id of the character this statement is
about.",
            "$ref": "#/definitions/characterID"
        },
        "value": {
            "description": "A value for this character for this taxon.
Must be either the id of a state, or an array of floats [min, max] for a
numerical range.",
            "oneOf": [
                {
                    "$ref": "#/definitions/stateID"
                }
            ]
        }
    }
}

```

```

{
  "type": "array",
  "items": {
    "type": "number"
  },
  "minItems": 2,
  "maxItems": 2
}
],
},
"frequency": {
  "description": "The frequency with which the taxon has this
value for this character.",
  "type": "number",
  "minimum": 0,
  "maximum": 1
},
"geography": {
  "description": "The area(s) in which the taxon can have this
property, represented as the coordinates array of a GeoJSON
MultiPolygon.",
  "$ref": "#/definitions/multiPolygon"
},
"geographyService": {
  "description": "An url or external service that returns
distribution information for this property.",
  "$ref": "#/definitions/url"
},
"media": {
  "description": "Illustration(s) of this particular taxon
having this particular property (this value for this character).",
  "oneOf": [
    {
      "$ref": "#/definitions/mediaID"
    },
    {
      "type": "array",
      "items": {
        "$ref": "#/definitions/mediaID"
      }
    }
  ]
},
},
"description": {
  "description": "Short description of the taxon having this
property (valid markdown).",
  "comment": "Accepts array for multilingual support.",
  "$ref": "#/definitions/localizedString",
  "contentMediaType": "text/markdown"
},
"descriptionDetails": {
  "description": "Extended description of the taxon having this

```

```
property that supplements the description (valid markdown).",
    "comment": "Accepts array for multilingual support.",
    "$ref": "#/definitions/localizedString",
    "contentMediaType": "text/markdown"
  },
  "descriptionUrl": {
    "description": "Hyperlink or resource to more information on
the taxon having this property.",
    "comment": "Accepts array for multilingual support.",
    "$ref": "#/definitions/localizedUrl"
  }
}
}
}
```