

附录2 Python程序包SP2000的简介、安装、配置和使用指南

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1. 简介

Python 程序包 SP2000 基于 Python3 编写的, 可以在 Windows、MacOS 以及 Linux 等多种操作系统上运行, 已上传到 Python 官网(<https://pypi.org/project/SP2000>, version 0.6)。其程序包含 8 个函数: set_search_key、search_family_id、search_taxon_id、search_checklist、get_redlist_china、get_col_global、find_synonyms 和 get_col_taiwan。

附录 2 文档由 R 程序包 *rmarkdown* (Allaire et al, 2020) 自动生成。Python 程序包 SP2000 测试基于 RStudio 软件, 用户首先需要先安装 R 软件, 再安装 RStudio 软件, R 软件下载的地址为: <http://cran.r-project.org/bin/windows/base/>, 用户根据自己的计算机操作系统, 选取相应 R 软件, 建议用户下载最新版的 R, 因为涉及到字符编码转换, R 版本不低于 3.0.0; RStudio 软件下载的地址为: <https://rstudio.com/products/rstudio/download/>, 用户根据安装的 R 软件选取相应的 RStudio 软件, 因为旧版本不能运行 Python 代码, 建议用户下载最新版的 RStudio。下面以“鳗鲡科(Anguillidae)”为例, 详细介绍 Python 程序包 SP2000 函数的使用, 并且通过 R 包 *reticulate* 包完成 R 调用 Python 结果, 调用方式 `py$*`。下文重点介绍 Python 程序包 SP2000 的安装、配置和使用指南。

丁刘勇, 李昊, 陶捐, 张金龙, 黄敏睿, 杨科, 王军, 丁城志, 何大明 (2021) 获取生物物种名录信息的 R 程序包 SP2000. 生物多样性, 29 (1): 118–122. <http://www.biodiversity-science.net/CN/10.17520/biods.2020235>

2. 安装 SP2000

```
#Check if reticulate is installed
if (requireNamespace ("reticulate", quietly = TRUE))
  install.packages ("reticulate")

## trying URL 'https://mirrors.tongji.edu.cn/CRAN/bin/macosx/contrib/4.0/reticulate_1.16.tgz'
## Content type 'application/octet-stream' length 1864511 bytes (1.8 MB)
## =====
##
## downloaded 1.8 MB
## The downloaded binary packages are in
## /var/folders/1x/5mjpgdggx0m754gnfv6_dyxqm0000gn/T//Rtmp9PBvfl/downloaded_packages

# Load the reticulate package
library ("reticulate")

# install SP2000 package
reticulate::py_install ("SP2000", pip = TRUE)

# Collecting package metadata (current_repodata.json): ...working... done
# Solving environment: ...working... done
#
# # All requested packages already installed.
#
# Collecting SP2000
# Using cached SP2000-0.6-py3-none-any.whl (12 kB)
# Requirement already satisfied, skipping upgrade: requests in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from SP2000) (2.23.0)
# Requirement already satisfied, skipping upgrade: pandas in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from SP2000) (1.0.4)
# Requirement already satisfied, skipping upgrade: certifi>=2017.4.17 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from requests->SP2000) (2020.6.20)
# Requirement already satisfied, skipping upgrade: urllib3!=1.25.0,!<1.25.1,<1.26,>=1.21.1 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from requests->SP2000) (1.25.9)
# Requirement already satisfied, skipping upgrade: idna<3,>=2.5 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from requests->SP2000) (2.9)
# Requirement already satisfied, skipping upgrade: chardet<4,>=3.0.2 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from requests->SP2000) (3.0.4)
# Requirement already satisfied, skipping upgrade: pytz>=2017.2 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from pandas->SP2000) (2020.1)
# Requirement already satisfied, skipping upgrade: numpy>=1.13.3 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from pandas->SP2000) (1.18.5)
# Requirement already satisfied, skipping upgrade: python-dateutil>=2.6.1 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from pandas->SP2000) (2.8.1)
# Requirement already satisfied, skipping upgrade: six>=1.5 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from python-dateutil>=2.6.1->pandas->SP2000) (1.15.0)
# Installing collected packages: SP2000
# Successfully installed SP2000-0.6

# install IPython package
reticulate::py_install (packages = "IPython", pip = TRUE)

# Collecting package metadata (current_repodata.json): ...working... done
# Solving environment: ...working... done
#
# # All requested packages already installed.
#
# Collecting IPython
# Using cached ipython-7.16.1-py3-none-any.whl (785 kB)
```

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```
# Requirement already satisfied, skipping upgrade: backcall in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (0.1.0)
# Requirement already satisfied, skipping upgrade: setuptools>=18.5 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (47.1.1.post20200529)
# Requirement already satisfied, skipping upgrade: pexpect; sys_platform != "win32" in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (4.8.0)
# Requirement already satisfied, skipping upgrade: prompt-toolkit!=3.0.0,!<3.0.1,<3.1.0,>=2.0.0 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (3.0.5)
# Requirement already satisfied, skipping upgrade: appnope; sys_platform == "darwin" in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (0.1.0)
# Requirement already satisfied, skipping upgrade: pickleshare in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (0.7.5)
# Requirement already satisfied, skipping upgrade: traitlets>=4.2 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (4.3.3)
# Requirement already satisfied, skipping upgrade: pygments in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (2.6.1)
# Requirement already satisfied, skipping upgrade: jedi>=0.10 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (0.17.0)
# Requirement already satisfied, skipping upgrade: decorator in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from IPython) (4.4.2)
# Requirement already satisfied, skipping upgrade: ptyprocess>=0.5 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from pexpect; sys_platform != "win32"->IPython) (0.6.0)
# Requirement already satisfied, skipping upgrade: wcwidth in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from prompt-toolkit!=3.0.0,!<3.0.1,<3.1.0,>=2.0.0->IPython) (0.2.3)
# Requirement already satisfied, skipping upgrade: ipython-genutils in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from traitlets>=4.2->IPython) (0.2.0)
# Requirement already satisfied, skipping upgrade: six in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from traitlets>=4.2->IPython) (1.15.0)
# Requirement already satisfied, skipping upgrade: parso>=0.7.0 in /Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages (from jedi>=0.10->IPython) (0.7.0)
# Installing collected packages: IPython
# Successfully installed IPython-7.16.1
```

3. 使用指南

3.1 加载 SP2000

```
#Import the SP2000 package
from SP2000.sp2000 import *
```

```
#Import the pprint package
from pprint import pprint
```

3.2 set_search_key 设置 Species 2000 密钥

注意: 在运行函数 search_family_id、search_taxon_id、search_checklist 之前需先申请“Species 2000”密钥, 注册物种 2000 中国节点 <http://www.sp2000.org.cn> 网站, 然后点击“用户信息”便可获取一个自己独享的 API 密钥服务, 最后调用一次函数 set_search_key(“your key”), 便可运行以上 search_* 函数。

```
#Note: You need to apply for the apiKey <http://www.sp2000.org.cn>
#to run search_* functions of this package.
set_search_key("06319834*****")
```

3.3 search_family_id 查询中国生物物种名录的科 id

```
#Search family IDs via family name
#Family name, or part of family name, supports Latin and Chinese names.
search_family_id ("鳗鲡科")

## {'鳗鲡科': ['3851c5311bed46c19529cb155d37aa9b']}

familyid = search_family_id ("Anguillidae")

pprint (familyid)

## {'Anguillidae': ['3851c5311bed46c19529cb155d37aa9b']}

#Calling Python from R
py$familyid

## $Anguillidae
## [1] "3851c5311bed46c19529cb155d37aa9b"
```

3.4 search_taxon_id 查询中国生物物种名录的种 id

```
#Search taxon IDs via familyID
taxonid1 = search_taxon_id (" ".join (familyid["Anguillidae"]),
                             name = "family_id")

pprint (taxonid1)

## {'3851c5311bed46c19529cb155d37aa9b': ['1bcb107bcbf74c6eb81554e398beb840',
##                                     '9b9b328f6fa045089021ba38f912a0e8',
##                                     'cbf03e5022f94c3daad91843b9f0b1e7',
##                                     'e192fbc15df24049bcd0fd01d307affa',
##                                     'f542929f776246efa44e559c389139d8']}

#Calling Python from R
py$taxonid1

## $`3851c5311bed46c19529cb155d37aa9b`
## [1] "1bcb107bcbf74c6eb81554e398beb840" "9b9b328f6fa045089021ba38f912a0e8"
## [3] "cbf03e5022f94c3daad91843b9f0b1e7" "e192fbc15df24049bcd0fd01d307affa"
## [5] "f542929f776246efa44e559c389139d8"

#Search taxon IDs via scientificName
taxonid2 = search_taxon_id ("Anguilla marmorata",
                             "Anguilla japonica",
                             "Anguilla bicolor",
                             "Anguilla nebulosa",
                             "Anguilla luzonensis",
                             name = "scientific_name")

pprint (taxonid2)

## {'Anguilla bicolor': ['1bcb107bcbf74c6eb81554e398beb840'],
## 'Anguilla japonica': ['f542929f776246efa44e559c389139d8'],
## 'Anguilla luzonensis': ['cbf03e5022f94c3daad91843b9f0b1e7'],
## 'Anguilla marmorata': ['e192fbc15df24049bcd0fd01d307affa'],
## 'Anguilla nebulosa': ['9b9b328f6fa045089021ba38f912a0e8']}
```

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```
#Calling Python from R
py$taxonid2

## $`Anguilla marmorata`
## [1] "e192fbc15df24049bcd0fd01d307affa"
##
## $`Anguilla japonica`
## [1] "f542929f776246efa44e559c389139d8"
##
## $`Anguilla bicolor`
## [1] "1bcb107bcbf74c6eb81554e398beb840"
##
## $`Anguilla nebulosa`
## [1] "9b9b328f6fa045089021ba38f912a0e8"
##
## $`Anguilla luzonensis`
## [1] "cbf03e5022f94c3daad91843b9f0b1e7"
```

3.5 search_checklist 查询中国生物物种名录信息

```
#Download detailed lists via species or infraspecies ID
x1 = search_checklist ('e192fbc15df24049bcd0fd01d307affa',
                      'f542929f776246efa44e559c389139d8',
                      '1bcb107bcbf74c6eb81554e398beb840',
                      '9b9b328f6fa045089021ba38f912a0e8',
                      'cbf03e5022f94c3daad91843b9f0b1e7')

pprint (x1['e192fbc15df24049bcd0fd01d307affa'])

# {'CommonNames': [],
#  'Distribution': 'Zhejiang(浙江)',
#  'Refs': [{'1': ''}, {'2': ''}],
#  'SpecialistInfo': [{'Address': '1 Beichen West Road, Chaoyang District, '
#                               'Beijing 100101, P.R.China(北京市朝阳区北辰西路 1 号院 5 号 '
#                               '中国科学院动物研究所)',
#                               'E-Mail': 'zhangcg@ioz.ac.cn',
#                               'Institution': 'Institute of Zoology, Chinese Academy of '
#                               'Sciences(中国科学院动物研究所)',
#                               'name': 'Zhang Chunguang(张春光)'},
#                    {'Address': '()',
#                               'E-Mail': 'zoskt@gate.sinica.edu.tw',
#                               'Institution': '(中央研究院生物多样性研究中心)',
#                               'name': 'Shao, Kwang-Tsao(邵广昭)'},
#                    {'Address': 'No.999, Huchenghuan Rd , Nanhui New City, '
#                               'Shanghai, P.R. China(上海市浦东新区沪城环路 999 号)',
#                               'E-Mail': '',
#                               'Institution': 'College of Life Science & Technology, '
#                               'Shanghai Ocean '
#                               'University(上海海洋大学生命科学与技术学院)',
#                               'name': 'Wu Hanlin(伍汉霖)}],
#  'author': 'Quoy et Gaimard, 1824',
#  'chineseName': '花鳗鲡',
#  'namecode': 'e192fbc15df24049bcd0fd01d307affa',
#  'scientificName': 'Anguilla marmorata',
#  'searchCode': 'e192fbc15df24049bcd0fd01d307affa',
#  'searchCodeStatus': 'accepted name',
#  'taxonTree': {'class': 'Actinopterygii',
#                'family': 'Anguillidae',
#                'genus': 'Anguilla',
```

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```
# 'infraspecies': '',
# 'kingdom': 'Animalia',
# 'order': 'Anguilliformes',
# 'phylum': 'Chordata',
# 'species': 'marmorata'}}
```

3.6 get_col_global 查询全球生物物种名录信息

```
#Get Catalogue of Life Global checklist via species name and id
x2 = get_col_global ("Anguilla marmorata",
                    "Anguilla japonica",
                    "Anguilla bicolor",
                    "Anguilla nebulosa",
                    "Anguilla luzonensis",
                    option="name")
#
pprint (x2['Anguilla marmorata'])

# [{'bibliographic_citation': 'Froese R. & Pauly D. (eds). (2020). FishBase '
#                               '(version Feb 2018). In: Species 2000 & ITIS '
#                               'Catalogue of Life, 2020-06-04 Beta (Roskov Y.; '
#                               'Ower G.; Orrell T.; Nicolson D.; Bailly N.; Kirk '
#                               'P.M.; Bourgoïn T.; DeWalt R.E.; Decock W.; '
#                               'Nieukerken E. van; Penev L.; eds.). Digital '
#                               'resource at www.catalogueoflife.org/col. Species '
#                               '2000: Naturalis, Leiden, the Netherlands. ISSN '
#                               '2405-8858.',
# 'id': '433e0a4fe332e565c1679fa149543d83',
# 'is_extinct': 'false',
# 'name': 'Anguilla marmorata',
# 'name_html': '<i>Anguilla marmorata</i> Quoy & Gaimard, 1824',
# 'name_status': 'accepted name',
# 'online_resource': 'http://www.fishbase.org/Summary/SpeciesSummary.php?ID=1275',
# 'rank': 'Species',
# 'record_scrutiny_date': [],
# 'source_database': 'FishBase',
# 'source_database_url': 'http://www.fishbase.org',
# 'url': 'http://www.catalogueoflife.org/col/details/species/id/433e0a4fe332e565c1679fa149543d83'},
# {'accepted_name': {'bibliographic_citation': 'Froese R. & Pauly D. (eds). '
#                                               '(2020). FishBase (version Feb '
#                                               '2018). In: Species 2000 & ITIS '
#                                               'Catalogue of Life, 2020-06-04 '
#                                               'Beta (Roskov Y.; Ower G.; '
#                                               'Orrell T.; Nicolson D.; Bailly '
#                                               'N.; Kirk P.M.; Bourgoïn T.; '
#                                               'DeWalt R.E.; Decock W.; '
#                                               'Nieukerken E. van; Penev L.; '
#                                               'eds.). Digital resource at '
#                                               'www.catalogueoflife.org/col. '
#                                               'Species 2000: Naturalis, '
#                                               'Leiden, the Netherlands. ISSN '
#                                               '2405-8858.',
# 'id': '94f902df44fd76bed84cdea361b24fd6',
# 'is_extinct': 'false',
# 'name': 'Anguilla bengalensis',
# 'name_html': '<i>Anguilla bengalensis</i> (Gray, 1831)',
# 'name_status': 'accepted name',
# 'online_resource': 'http://www.fishbase.org/Summary/SpeciesSummary.php?ID=1272',
# 'rank': 'Species',
# 'record_scrutiny_date': [],
# 'source_database': 'FishBase',
```

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```
# 'source_database_url': 'http://www.fishbase.org',
# 'url': 'http://www.catalogueoflife.org/col/details/species/id/94f902df44fd76bed84cdea361b24fd6'},
# 'bibliographic_citation': 'Froese R. & Pauly D. (eds). (2020). FishBase '
# '(version Feb 2018). In: Species 2000 & ITIS '
# 'Catalogue of Life, 2020-06-04 Beta (Roskov Y.; '
# 'Ower G.; Orrell T.; Nicolson D.; Bailly N.; Kirk '
# 'P.M.; Bourgoin T.; DeWalt R.E.; Decock W.; '
# 'Nieuwerkerken E. van; Penev L.; eds.). Digital '
# 'resource at www.catalogueoflife.org/col. Species '
# '2000: Naturalis, Leiden, the Netherlands. ISSN '
# '2405-8858.',
# 'id': '1a44a32b532e87f048b6bfa8fed07098',
# 'name': 'Anguilla marmorata',
# 'name_html': '<i>Anguilla marmorata</i> (non Quoy & Gaimard, 1824)',
# 'name_status': 'misapplied name',
# 'online_resource': '',
# 'rank': 'Species',
# 'source_database': 'FishBase',
# 'source_database_url': 'http://www.fishbase.org',
# 'url': 'http://www.catalogueoflife.org/col/details/species/id/94f902df44fd76bed84cdea361b24fd6/synonym/1a44a32b532e87f048b6bfa8fed07098']}]
```

3.7 get_redlist_china 查询中国物种红色名录信息

```
#Query Redlist of Chinese Biodiversity
```

```
x3 = get_redlist_china (group = 'Inland Fishes')
```

```
pprint (x3) # pandas DataFrame
```

```
#      family_c      family      species_c ...      group_c      kingdom      kingdom_c
# 10436  七鳃鳗科  Petromyzontidae  东北七鳃鳗 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 10437  七鳃鳗科  Petromyzontidae  雷氏七鳃鳗 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 10438  七鳃鳗科  Petromyzontidae  北极七鳃鳗 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 10439  丝足鲈科  Osphronemidae   线足鲈 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 10440  亚口鱼科  Catostomidae   胭脂鱼 ...  内陆鱼类  Vertebrate  脊椎动物卷
# ...      ...      ...      ...      ...      ...      ...
# 11874  鱧科      Channidae    沃氏鱧 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 11875  鱧科      Channidae    黑月鱧 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 11876  鲢科      Pangasiidae  长丝鲢 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 11877  鲢科      Pangasiidae  贾巴鲢 ...  内陆鱼类  Vertebrate  脊椎动物卷
# 11878  鲢科      Pangasiidae  巨无齿鲢 ...  内陆鱼类  Vertebrate  脊椎动物卷
#
#[1443 rows x 11 columns]
```

3.8 find_synonyms 查询全球生物物种同物异名

```
#Find synonyms via species name from Catalogue of Life Global
```

```
x4 = find_synonyms ("Anguilla marmorata",
                    "Anguilla japonica")
```

```
pprint (x4)
```

```
# {'Anguilla japonica': {'Anguilla angustidens',
#                        'Anguilla breviceps',
#                        'Anguilla manabei',
#                        'Anguilla nigricans',
#                        'Anguilla remifera',
#                        'Muraena pkinensis'},
```

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```
# 'Anguilla marmorata': {'Anguilla fidjiensis',  
#                       'Anguilla hildebrandti',  
#                       'Anguilla johannae',  
#                       'Anguilla labrosa',  
#                       'Anguilla marmolata',  
#                       'Anguilla mauritiana',  
#                       'Muraena manillensis',  
#                       'Muraena mossambica'}}
```

3.9 get_col_taiwan 查询台湾生物物种名录信息

```
#Search Catalogue of Life Taiwan checklist
```

```
x5 = get_col_taiwan ("Anguillidae", level = "family")
```

```
pprint (x5)
```

```
# {'Anguillidae': [{'author': 'Schmidt, 1928',  
#                   'author2': None,  
#                   'class': 'Actinopterygii',  
#                   'class_c': '條鰩魚綱',  
#                   'common_name_c': '太平洋雙色鰩鱧;短鰩鰩;二色鰩',  
#                   'dataprovider': None,  
#                   'endemic': None,  
#                   'family': 'Anguillidae',  
#                   'family_c': '鰩鱧科',  
#                   'genus': 'Anguilla',  
#                   'genus_c': '鰩鱧屬',  
#                   'infraspecies': 'pacifica',  
#                   'infraspecies2': None,  
#                   'infraspecies2_marker': None,  
#                   'infraspecies_marker': None,  
#                   'kingdom': 'Animalia',  
#                   'kingdom_c': '動物界',  
#                   'name_code': '380710',  
#                   'order': 'Anguilliformes',  
#                   'order_c': '鰩形目',  
#                   'phylum': 'Chordata',  
#                   'phylum_c': '脊索動物門',  
#                   'species': 'bicolor'},  
#                   {'author': 'Kaup, 1856',  
#                     'author2': None,  
#                     'class': 'Actinopterygii',  
#                     'class_c': '條鰩魚綱',  
#                     'common_name_c': '西里伯斯鰩鱧;西里伯斯鰩;鰩;黑鰩',  
#                     'dataprovider': None,  
#                     'endemic': None,  
#                     'family': 'Anguillidae',  
#                     'family_c': '鰩鱧科',  
#                     'genus': 'Anguilla',  
#                     'genus_c': '鰩鱧屬',  
#                     'infraspecies': None,  
#                     'infraspecies2': None,  
#                     'infraspecies2_marker': None,  
#                     'infraspecies_marker': None,  
#                     'kingdom': 'Animalia',  
#                     'kingdom_c': '動物界',  
#                     'name_code': '395489',  
#                     'order': 'Anguilliformes',  
#                     'order_c': '鰩形目',
```


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```
#      'phylum': 'Chordata',
#      'phylum_c': '脊索動物門',
#      'species': 'celebesensis'},
#      {'author': 'Temminck & Schlegel, 1846',
#      'author2': None,
#      'class': 'Actinopterygii',
#      'class_c': '條鰭魚綱',
#      'common_name_c': '日本鰻鱺;白鰻;日本鰻;正鰻;白鰻;鰻鱺;土鰻;淡水鰻',
#      'dataprovider': None,
#      'endemic': None,
#      'family': 'Anguillidae',
#      'family_c': '鰻鱺科',
#      'genus': 'Anguilla',
#      'genus_c': '鰻鱺屬',
#      'infraspecies': None,
#      'infraspecies2': None,
#      'infraspecies2_marker': None,
#      'infraspecies_marker': None,
#      'kingdom': 'Animalia',
#      'kingdom_c': '動物界',
#      'name_code': '380711',
#      'order': 'Anguilliformes',
#      'order_c': '鰻形目',
#      'phylum': 'Chordata',
#      'phylum_c': '脊索動物門',
#      'species': 'japonica'},
#      {'author': 'Watanabe, Aoyama & Tsukamoto, 2009',
#      'author2': None,
#      'class': 'Actinopterygii',
#      'class_c': '條鰭魚綱',
#      'common_name_c': '呂宋鰻鱺;呂宋鰻;黃氏鱸鰻',
#      'dataprovider': None,
#      'endemic': None,
#      'family': 'Anguillidae',
#      'family_c': '鰻鱺科',
#      'genus': 'Anguilla',
#      'genus_c': '鰻鱺屬',
#      'infraspecies': None,
#      'infraspecies2': None,
#      'infraspecies2_marker': None,
#      'infraspecies_marker': None,
#      'kingdom': 'Animalia',
#      'kingdom_c': '動物界',
#      'name_code': '395491',
#      'order': 'Anguilliformes',
#      'order_c': '鰻形目',
#      'phylum': 'Chordata',
#      'phylum_c': '脊索動物門',
#      'species': 'luzonensis'},
#      {'author': 'Quoy & Gaimard, 1824',
#      'author2': None,
#      'class': 'Actinopterygii',
#      'class_c': '條鰭魚綱',
#      'common_name_c': '花鰻鱺;鱸鰻;花鰻;烏耳鰻;土龍;黑鰻',
#      'dataprovider': None,
#      'endemic': None,
#      'family': 'Anguillidae',
#      'family_c': '鰻鱺科',
#      'genus': 'Anguilla',
#      'genus_c': '鰻鱺屬',
```

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```
# 'infraspecies': None,  
# 'infraspecies2': None,  
# 'infraspecies2_marker': None,  
# 'infraspecies_marker': None,  
# 'kingdom': 'Animalia',  
# 'kingdom_c': '動物界',  
# 'name_code': '380712',  
# 'order': 'Anguilliformes',  
# 'order_c': '鰻形目',  
# 'phylum': 'Chordata',  
# 'phylum_c': '脊索動物門',  
# 'species': 'marmorata']}]}
```

3.10 测试环境

```
#Collect Information About the Current Python Session  
import IPython  
print (IPython.sys_info())  
  
## {'commit_hash': '2486838d9',  
## 'commit_source': 'installation',  
## 'default_encoding': 'UTF-8',  
## 'ipython_path': '/Users/yong/Library/r-miniconda/envs/r-reticulate/lib/python3.6/site-packages/IPython',  
## 'ipython_version': '7.16.1',  
## 'os_name': 'posix',  
## 'platform': 'Darwin-19.5.0-x86_64-i386-64bit',  
## 'sys_executable': '/Users/yong/Library/r-miniconda/envs/r-reticulate/bin/python',  
## 'sys_platform': 'darwin',  
## 'sys_version': '3.6.10 | packaged by conda-forge | (default, Apr 24 2020, '  
## '16:29:39) \n'  
## [GCC Clang 9.0.1 ]}
```

参考文献

Allaire J, Xie YH, McPherson J, Luraschi J, Ushey K, Atkins A, Wickham H, Cheng J, Chang W, Iannone R (2020) rmarkdown: Dynamic Documents for R. R package version 2.1. <https://rmarkdown.rstudio.com>. (accessed on 2020-06-08)