Identification guide of Invasive Alien Species of Union concern

Support for customs on the identification of IAS of Union concern

Text: Riccardo Scalera, Johan van Valkenburg, Sandro Bertolino, Elena Tricarico

Illustrations: Massimiliano Lipperi, Studio Wildart

This note has been drafted by a team of experts under the supervision of IUCN within the framework of the contract No 07.0202/2017/763436/SER/ENV.D2 "*Technical and Scientific support in relation to the Implementation of Regulation 1143/2014 on Invasive Alien Species*". The information and views set out in this note do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this note. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein. Reproduction is authorised provided the source is acknowledged. This document shall be cited as:

IUCN. 2018. Identification guide of Invasive Alien Species of Union concern. Support for customs on the identification of IAS of Union concern, part II. Technical note prepared by IUCN for the European Commission.

Date of completion: 06/11/2018

Comments which could support improvement of this document are welcome. Please send your comments by e-mail to <u>ENV-IAS@ec.europa.eu</u>.

Table of contents

Myriophyllum aquaticum	3
Myriophyllum heterophyllum	9
Pennisetum setaceum	15
Orconectes limosus	20
Sciurus carolinensis	25

Myriophyllum aquaticum

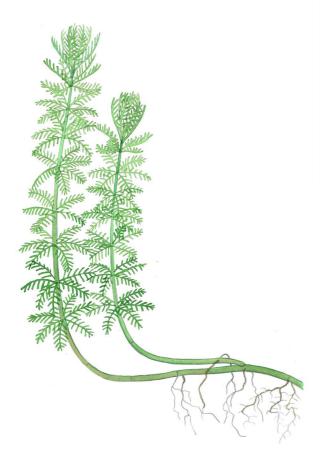
Parrot's feather, parrot feather watermilfoil

Synonyms

Enydria aquatica Vell., *Myriophyllum brasiliense* Cambess., *Myriophyllum proserpinacoides* Gillies ex Hook. & Arn.

Species ID

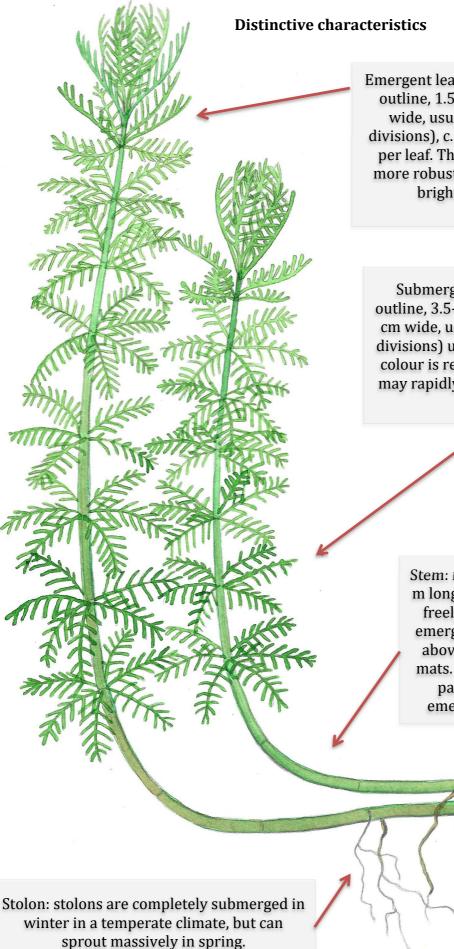
Kingdom: Plantae Phyllum: Tracheophyta Class: Spermatopsida Order: Saxifragales Family: Haloragidaceae Genus: *Myriophyllum* Species: *Myriophyllum aquaticum*



General description:

A dioecious aquatic or amphibious plant glaucous green in colour, characterised by submerged and emergent stems, which may extend from banks, or from deep waters, forming dense entangled mats. It is characterised by featherlike leaves in whorls of 4-6. Leaf stiffness and dimensions differ considerably depending on whether they grow in the emerged or submerged part of the plant. Another distinctive trait is the typical shape of emergent stems and leaves looking like miniature pine or fir trees. It can be found in a number of freshwater environments, particularly in still or slowly flowing waters rich in nutrients, such as lakes, marshes, ponds, streams and canals with muddy substrates (but also in banks, and muddy grounds near water).

Size: Stems (2-)3-4(-5) m in length, submerged leaves 3.5-4.0 cm long, (0.4)0.8-1.2 cm wide, emergent leaves (1.5-)2.5-3.5 cm long, (0.4-)0.7-0.8 cm wide.



Emergent leaves: narrowly oblanceolate in outline, 1.5-3.5 cm long and 0.4-0.8 cm wide, usually with 18-36 pinnae (or divisions), c. 5 mm long and 0.3 mm wide, per leaf. They are slightly incurved and more robust than submerged leaves and bright blue-green in colour.

Submerged leaves: oblanceolate in outline, 3.5-4.0 cm long and (0.4-)0.8-1.2 cm wide, usually with 25-30 pinnae (or divisions) up to 0.7 cm long per leaf. The colour is reddish orange or green. They may rapidly decay leaving bare sections of stems.

> Stem: robust glabrous stems, up to 4 m long, and 4-5 mm at base, rooting freely from the lower nodes. The emergent part can rise up to 50 cm above the water surface in dense mats. The colour of the submerged part is usually red, while the emergent section is blue-green.

4

Leaves: oblanceolate in outline and pectinate, 3.5-4.0 cm long and 0.4-1.2 cm wide, arranged around the stem in whorls of 4-6. They are usually more densely packed upward. Female flowers: on very short pedicels in the upper leaf axils, between 2 small bracts. Characterised by 4 white, deltoid, denticulate sepals (size: 0.4-0.5 Inflorescence: very small, mm long and 0.3 mm wide) and inconspicuous, axillary, prominent stigmas with numerous fine indeterminate spike with white hairs. Petals absent. Pyriform unisexual flowers just ovary, 0.6-0.7 mm long, 0.6 mm wide, above emergent leaves, longitudinally ribbed between sepals. subtended by 2 bracteoles. Male flowers: There are no male plants present in Fruit: not observed in Europe. Europe.

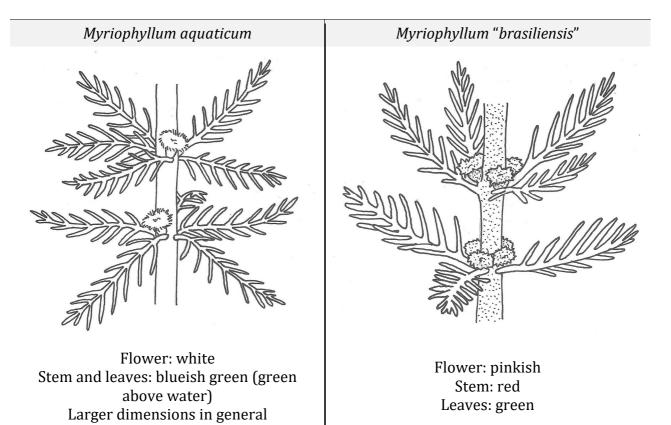
Similar species

When traded as submerged plant material the identification of *Myriophyllum* species is quite challenging. In many cases reliable identification can only be achieved with molecular tools. *Myriophyllum aquaticum* has largely been traded as potted plants or rarely imported as bunches of emergent shoots. In exceptional cases the species was traded as submerged shoots, but this product is very fragile as such.

Comparative table of leaf types species of common aquatic plants traded as oxygenating plants:

Myriophyllum	Cabomba
Featherlike in whorls	Fan shaped
Ceratophyllum	Hydrocharitaceae ("waterpest species")
2-3 times jugate	Leaf arranged in whorls (not divided, not composed)

In trade as a potted plant *M. aquaticum* can only be confused with material that appears to be known in cultivation and is traded as "*Myriophyllum brasiliensis*" (this name however is a synonym *of M. aquaticum*).



Common names

BG	Мирофилум (genus name)
HR	Vodeni krocanj
CS	Stolístek vodní
DA	Papegøjefjer
NL	Parelvederkruid
EN	Parrot's feather
ET	Brasiilia vesikuusk
FI	Isoärviä
FR	Myriophylle aquatique
DE	Brasilianisches Tausendblatt
EL	-
HU	Strucctoll-süllőhínár

GA	Líonán cleiteach
IT	Millefoglio d'acqua
LV	-
LT	Stambioji plunksnalapė
МТ	-
PL	Wywłócznik brazylijski
РТ	Milefólio-aquático
RO	-
SK	Stolístok vodný
SL	Brazilski rmanec
ES	Cola de zorro acuática
SV	Storslinga

Key references

CABI. 2018. *Myriophyllum aquaticum*. In: Invasive Species Compendium. Wallingford, UK: CAB International. <u>www.cabi.org/isc</u>

Orchard, A.E. 1981. A revision of South American *Myriophyllum* (Haloragaceae) and its repercussions on some Australian and North American species. *Brunonia*, *4*: 27-65.

http://www.q-bank.eu/Plants/lookalikes/Myriophyllum/Myriophyllum.HTML

http://keys.lucidcentral.org/keys/v3/aquatic_plants/

Myriophyllum heterophyllum

Various-leaved water-milfoil, two-leaf watermilfoil

Synonyms None

Species ID

Kingdom: Plantae Phyllum: Tracheophyta **Class:** Spermatopsida **Order:** Saxifragales Family: Haloragidaceae Genus: *Myriophyllum* Species: Myriophyllum heterophyllum



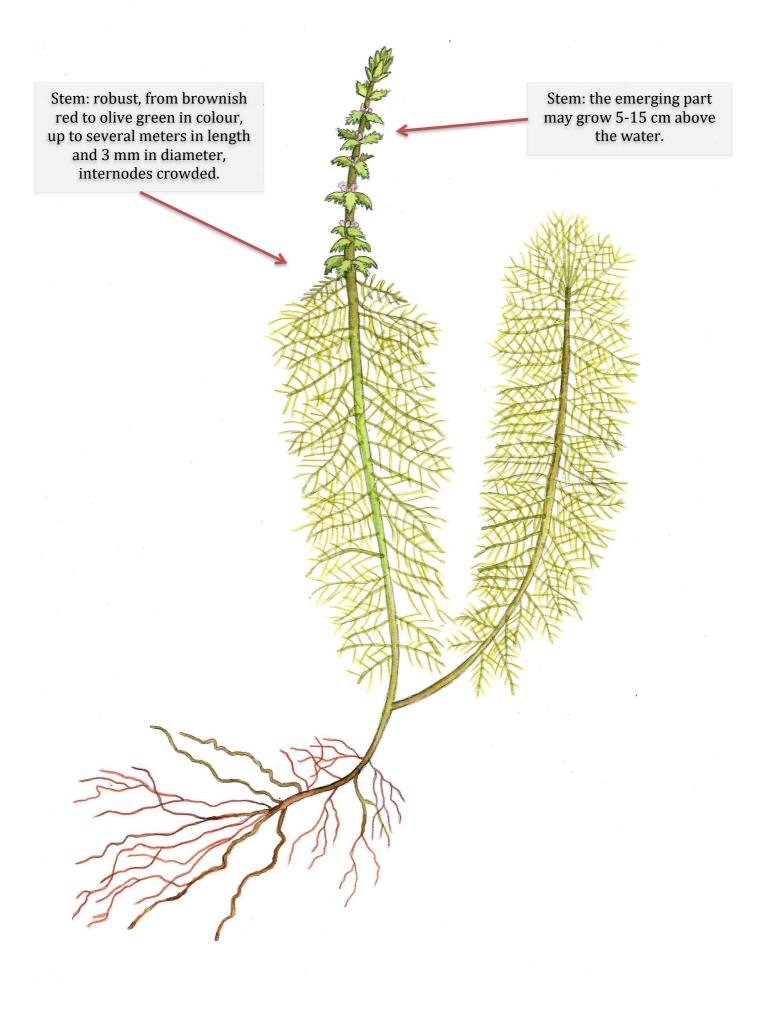
General description:

A perennial evergreen submerged aquatic herb, having both submerged and emergent leaf forms. Submerged leaves are feather-like and pinnate (2-5 cm long and 2-4 cm wide). Each leaf has 8-22 pinnae. Emergent leaves can take two forms, either a terrestrial form (pinnately dissected). which is expressed when growing on damp mud, or an emergent leaf form (entire toothed) on a stem on which flowers are produced. Emergent leaves are variable in both shape and structure, 4-30 mm long, 1.5–3 mm wide and stiff in texture. May occur in a number of freshwater environments, particularly in shallow and slow-moving waters like lakes, ponds, rivers and swamps, but also in semi-terrestrial conditions, e.g. stranded on muddy grounds, but this is merely a survival strategy.

Size: Stem up to several meters in length, depending on water depth and stream velocity.

Disclaimer: *Myriophyllum* species are reportedly difficult to identify based only on their morphology. Identification relies mostly on characters of flowers and fruits, which may not be present on these plants, as they rarely flower. Hence, genetic identifications may be required.

Distinctive characteristics



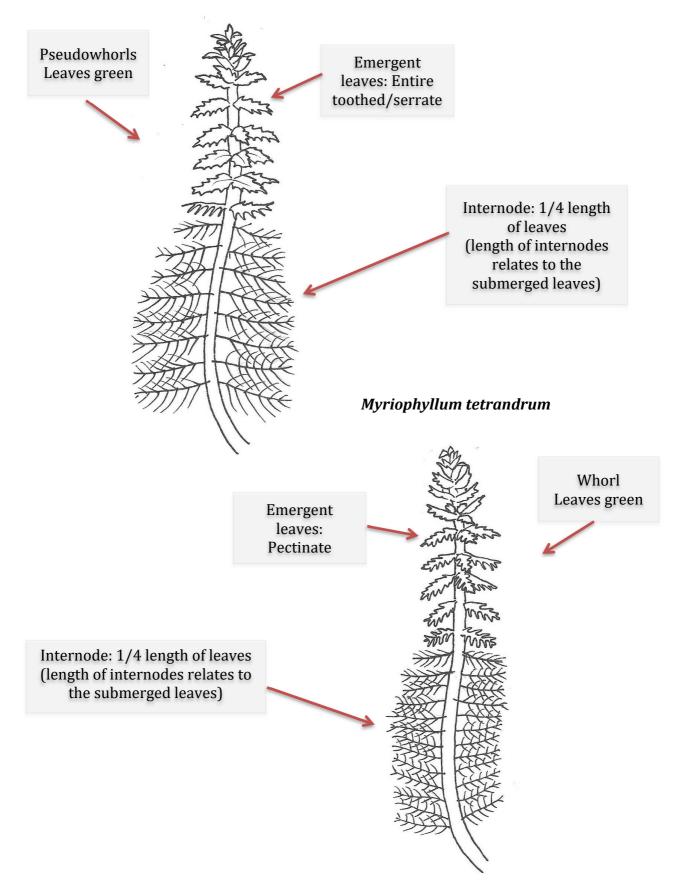
Emergent leaves: leaves in the emergent shoot bearing flowers are actually bracts, bright-green, stiff, undivided, serrated to toothed, 0.4-3 cm long and 1.5-5 mm wide, very variable in both shape and structure. Flowers: very tiny (about 1 mm long) and grow in whorls of 4 in emergent terminal spikes of 5-15(-35 cm) in length. In the native range with female flowers below, hermaphrodite flowers in the middle and male ones at the top. So far in Europe only female flowers, reddish in colour, observed.

Fruits: None observed in Europe.

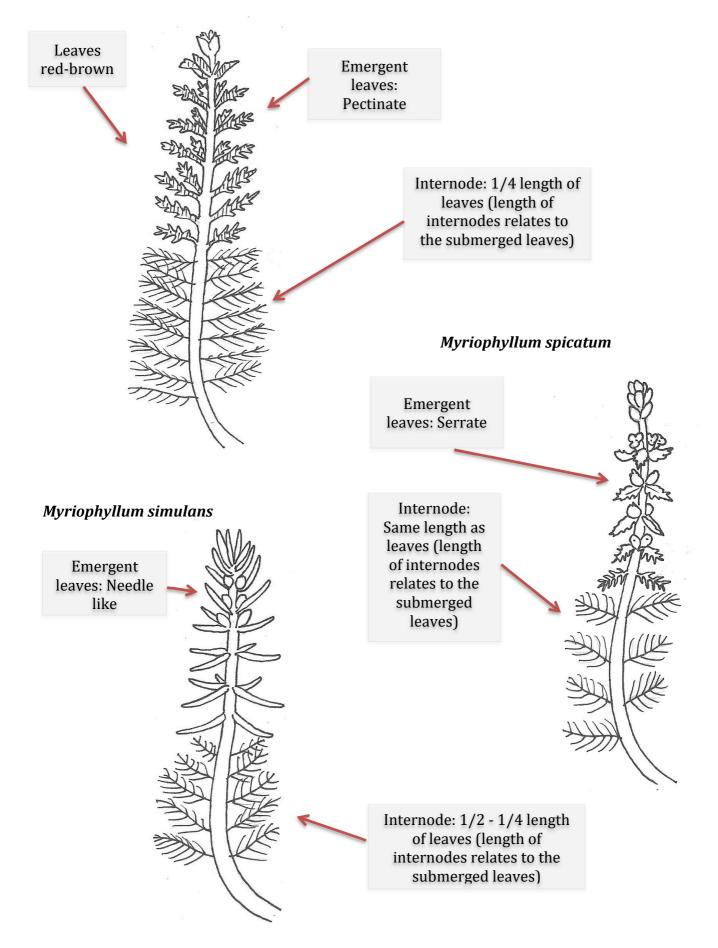
Submerged leaves: green, feather-like and pinnate, arranged into pseudowhorls of 4-5 leaves, 2-5 cm long and 2-4 cm wide. Deeply divided: 8–22 pinnae (or division) per leaf.

Similar species

Myriophyllum heterophyllum



Myriophyllum tuberculatum



Common names

BG	-
HR	-
CS	Stolístek různolistý
DA	Forskelligbladet tusindeblad
NL	Ongelijkbladig vederkruid
EN	Broadleaf watermilfoil
ET	Erilehine vesikuusk
FI	Kampaärviä
FR	Myriophylle hétérophylle
DE	Verschiedenblättriges Tausendblatt
EL	-
HU	Felemáslevelű süllőhínár

GA	-
IT	Millefoglio d'acqua eterofillo
LV	-
LT	Kaičioji plunksnalapė
МТ	-
PL	Wywłócznik różnolistny
PT	-
RO	-
SK	Stolístek různolistý
SL	Raznolistni rmanec
ES	-
SV	Kamslinga

Key references

CABI. 2018. *Myriophyllum heterophyllum*. In: Invasive Species Compendium. Wallingford, UK: CAB International. <u>www.cabi.org/isc</u>

http://www.q-bank.eu/Plants/lookalikes/Myriophyllum/Myriophyllum.HTML

http://keys.lucidcentral.org/keys/v3/aquatic_plants/

EPPO. 2016. Data sheets on pests recommended for regulation/Fiches informatives sur les organismes recommandes pour réglementation: *Myriophyllum heterophyllum* Michaux. *Bulletin OEPP/EPPO Bulletin, 46*(1): 20–24.

Fountain grass

Synonyms

Pennisetum ruppelii Steud., Phalaris setacea Forssk. [Cenchrus setaceus (Forssk.) Morone¹]

Species ID

Kingdom: Plantae Phyllum: Tracheophyta Class: Spermatopsida Order: Poales Family: Poaceae Genus: *Pennisetum* Species: *Pennisetum setaceum*

General description:

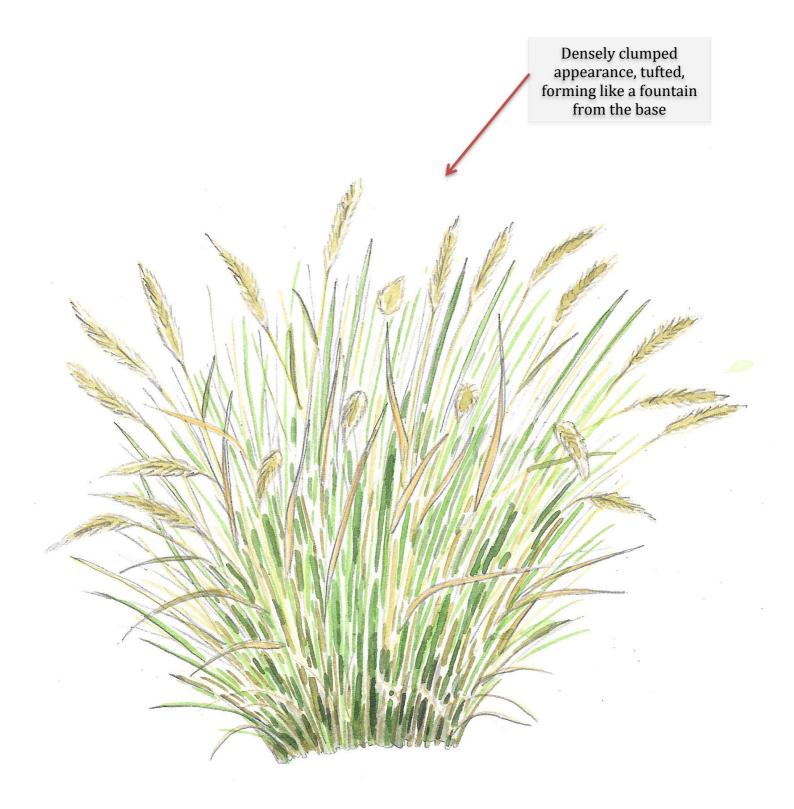
Perennial clump-forming grass with erect to arching culms growing over one metre in height, hence the English common name, fountain grass. It is characterised by distinctive cream, pink or purple coloured inflorescences up to 32 cm long, with a glabrous peduncle. Fruits are small, dry achenes adorned with long showy bristles. Leaves are green or brown depending on water availability and season.



Size: Stems: 20 to 130 cm high. Inflorescence: a 8-32 cm long panicle, leaves: rolled 0.1-0.3 cm wide and 30-100 cm long.

¹ According to recent molecular findings and phylogenetic relations the genera *Cenchrus* and *Pennisetum* should be united and new combinations in *Cenchrus* to be followed.

Distinctive characteristics

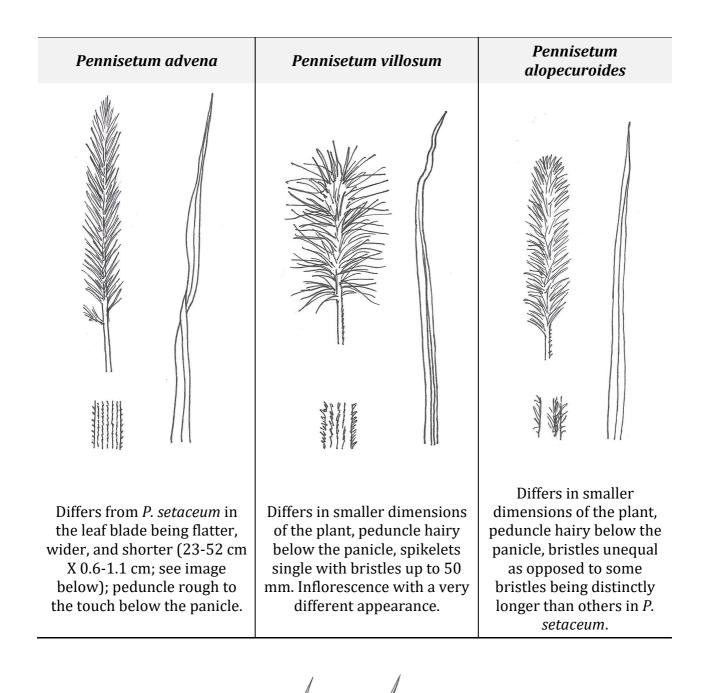


Similar species

Inflorescence: an upright panicle 8-32 cm long and up to 5 cm wide, comprising grouped bristly spikelets placed on stalks. Peduncle glabrous below the panicle. Colour may vary from light green (i.e. in case of immature plants) to cream, tan or pinkish purple.

Green or brown, slender, involute leaves 1–3.7 mm wide and 30–100 cm long with a prominent central vein and edges rough to the touch.

> Spikelet: about 6 mm long, with prominent bristles, in clusters of 1-3. Stipe relatively long, over 1.1 mm



vena

Pennisetum setaceum

Pennisetum advena

Example of the contrast between a flattened leaf as in *P. advena* and an inrolled/ involute leaf as in *P. setaceum* (flat versus half-tube).

<u>Remark</u>: Complicating factors are that dozens of cultivars are in trade which differ greatly in dimensions and colour of panicle. See https://keys.lucidcentral.org/keys/v3/pennisetum/.

Common names

BG	фонтан трева
HR	Pernata trava/ Rubrum
CS	Dochan setý
DA	Lampepudsergræs
NL	Fraai lampenpoetsergras
EN	Fountain grass
ET	Harjas hiidhirss
FI	Arabiansulkahirssi
FR	Herbe aux ecouvillons Rouge
DE	Federborstengras
EL	ΠΕΝΙΣΕΤΟ
HU	Rózsás tollborzfű

GA	-
IT	Penniseto allungato
LV	Purpurvioletā sarzāle
LT	Šeriuotoji soruolė
МТ	Pjuma
PL	Rozplenica szczecinkowata
РТ	Capim-do-texas
RO	No common name, unofficially known as 'Rubrum'
SK	Perovec veľkokvetý
SL	Rdečelistna ščetinasta perjanka
ES	Hierba fuente africana
SV	Fjäderborstgräs

Key references

Chemisquy, M.A., Giussani, L.M., Scataglini, M.A., Kellogg, E.A. and Morrone, O. 2010. Phylogenetic studies favour the unification of *Pennisetum, Cenchrus* and *Odontelytrum* (Poaceae): a combined nuclear, plastid and morphological analysis, and nomenclatural combinations in *Cenchrus. Annals of Botany, 106*(1): 107-130.

Veldkamp, J.F. 2014. A revision of *Cenchrus* incl. *Pennisetum* (Gramineae) in Malesia with some general nomenclatural notes. *Blumea-Biodiversity, Evolution and Biogeography of Plants, 59*(1): 59-75.

https://keys.lucidcentral.org/keys/v3/pennisetum/

Orconectes limosus

Spiny-cheek crayfish

Synonyms Faxonius limosus

Species ID

Kingdom: Metazoa Division: Arthropoda Class: Malacostraca Order: Decapoda Family: Cambaridae Genus: Orconectes² Species: Orconectes limosus

General description:

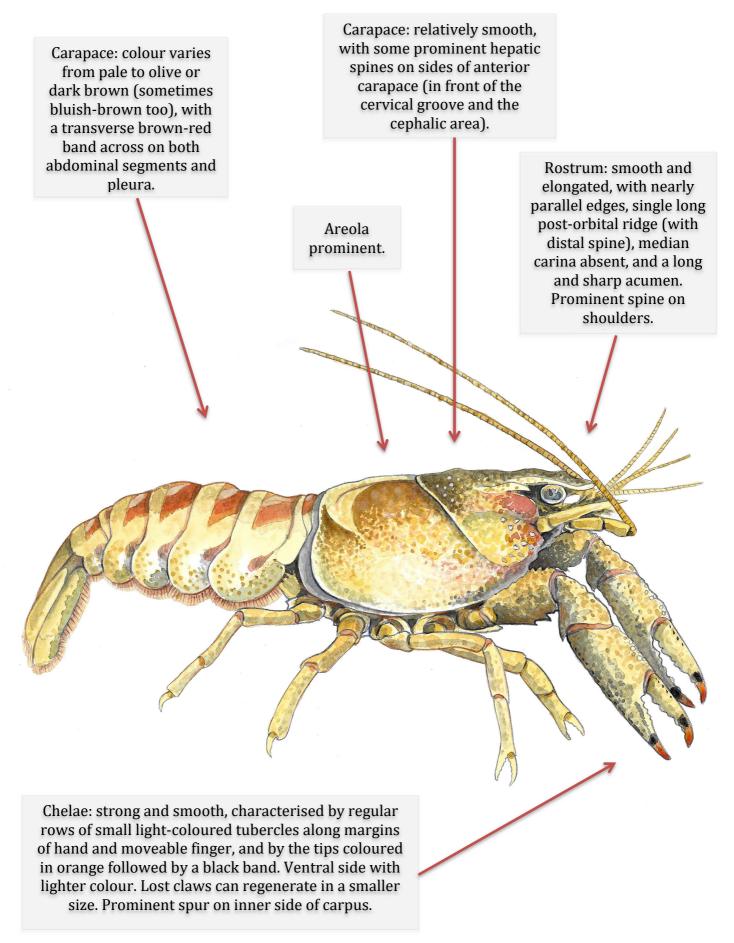
Medium-sized crayfish, characterised by transverse reddish-brown bands across the abdominal segments and on pleura. Other distinctive features are the presence of sharp hepatic spines on the side of the carapace in front of the cervical groove (hence the English common name) and the tip of the chelae orange and black. Usually found in a wide range of freshwater environments, including temporary and polluted habitats which the species can tolerate pretty well.

Size: Total body length up to 12 cm.

Disclaimer: Species identification may be difficult for non-experts and laypeople, hence it is usually recommended to contact an expert. In general, for correct identification, the animals need to be captured because the distinctive characteristics are not always visible from a distance and may be not well developed (particularly in juveniles). In some cases, identification may require specific checks, e.g. spines or male gonopod morphology (which can require the use of microscope).

² This species underwent a reclassification in August 2017, changing the genus *Orconectes* to *Faxonius* (Crandall and De Grave 2017). Crandall, K.A. and S. De Grave. 2017. An updated classification of the freshwater crayfishes (Decapoda: Astacidea) of the world, with a complete species list. *Journal of Crustacean Biology*, *37*(5):615-653. https://doi.org/10.1093/jcbiol/rux070.

Distinctive characteristics



Similar species

	Carapace	Chelae
Orconectes virilis		
	Rostrum without median carina. Parallel margins. Open areola.	Broad and flat, with straight margin on movable finger. Rows of tubercles. May be blue in colour.
Orconectes rusticus ³		
	Rostrum without median carina. Open areola. Dark, rusty spots on either side of its carapace.	Dark rusty spots. Tubercles not in rows. Oval gap when closed.
Orconectes immunis		
	No hepatic spines on lateral margins of carapace. Typical pale bands running along dorsal surface of abdomen.	Broad, flattened tuberculate chela, with straight margin of movable finger.

³ Some risk of confusion may exist with *Orconectes juvenilis*, a species phenotypically similar to *Orconectes rusticus* (see this species description) recently found in France. In fact, in France, *O. juvenilis* was initially misidentified with *O. rusticus* and only the gonopod and genetic analyses led to the correct identification. Thus, in case of doubts, an expert is needed to confirm the identification.

	Carapace	Chelae
Procambarus fallax f. virginalis		
	Open areola	Very small, weakly granulate.
Pacifastacus Ieniusculus		
	Rostrum with median carina. Large areola.	Robust and smooth, with white turquoise patch on top of junction of fingers.
Procambarus clarkii		
	No areola.	S-shaped, covered with small bumps.

Other species alien to Europe

Common names

BG	Американски шипобузест рак
HR	Bodljobradi rak
CS	Rak pruhovaný
DA	Amerikansk flodkrebs
NL	Gevlekte Amerikaanse rivierkreeft
EN	Spinycheek crayfish
ET	Ogapõskne vähk
FI	Amerikankääpiörapu
FR	Écrevisse américaine
DE	Kamberkrebs
EL	Ποταμοκαραβίδα της Αμερικής
HU	Cifrarák

GA	-
IT	Gambero americano
LV	Dzeloņvaigu vēzis
LT	Rainuotasis vėžys
MT	-
PL	Rak pręgowany
РТ	Lagostim-dos-canais
RO	Racul dungat
SK	Rak pruhovaný
SL	Trnavec
ES	Cangrejo de los canales
SV	Amerikansk dvärgkräfta

Key references

Pockl, M., Holdich, D. and Pennerstorder, J. 2006. Identifying native and alien crayfish species in Europe. Melk, Austria: European Project CRAYNET, Guglar Cross Media, 47.

Souty-Grosset, C., Holdich, D., Noël, O., Reynolds, J. and Haffner, P. (Eds) 2006. Atlas of crayfish in Europe. Museum National d'Histoire Naturelle, Paris.

Sciurus carolinensis

Eastern grey squirrel, Eastern gray squirrel (in American English)

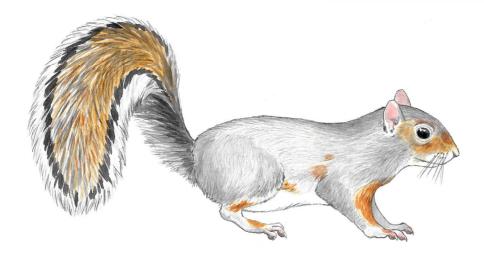
Synonyms None

Species ID

Kingdom: Metazoa Phylum: Chordata Class: Mammalia Order: Rodentia Family: Sciuridae Genus: *Sciurus* Species: *Sciurus carolinensis*

General description:

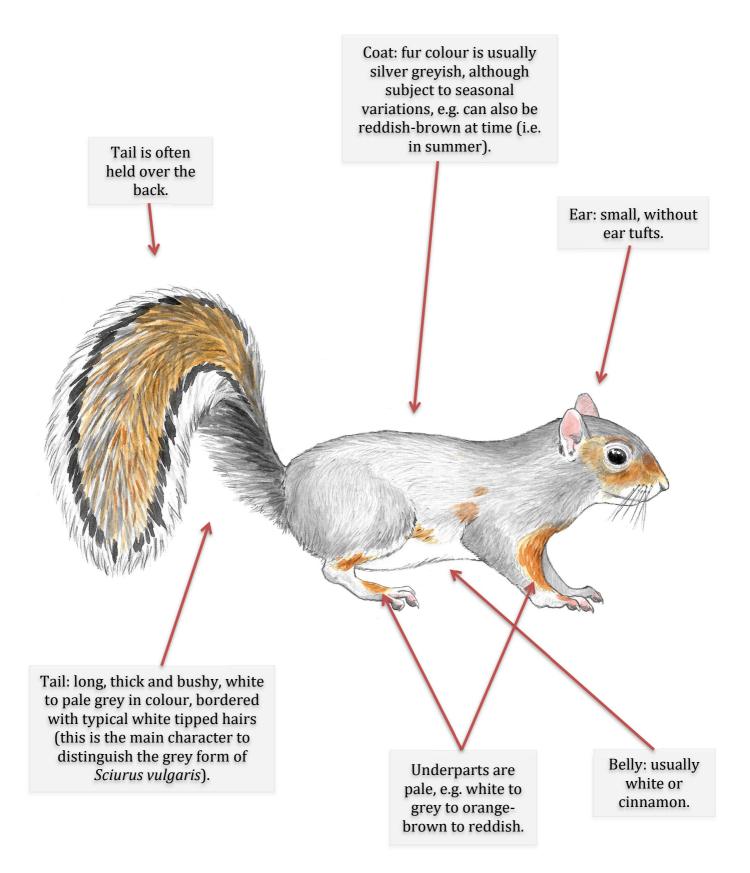
Medium-sized tree squirrel with dark to pale grevish aguti fur, at time tawny colour, in particular on the hips, feet, head and sometimes on the back (i.e. especially in summer), with white to underparts melanistic (but grey individuals that totally black in colour are also known, while albinism is rare). A main distinctive feature is represented by a white band on the borders of the fluffy tail. No sexual dimorphism in size or colouration. Geographical variation is considerable with different colour forms.



Size: Total length: 38-53 cm, tail length of 15-25 cm. Weight: 300-710 g.

Disclaimer: In general, among squirrels the same species may be characterised by a high degree of variability between populations, while different species may look extremely similar to each other. Therefore, the drawings in this document must be considered only indicative, and for the correct identification of a species the advice of expert taxonomists is required.

Distinctive characteristics

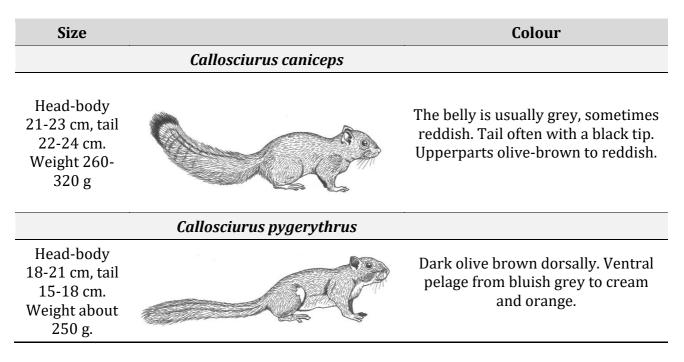


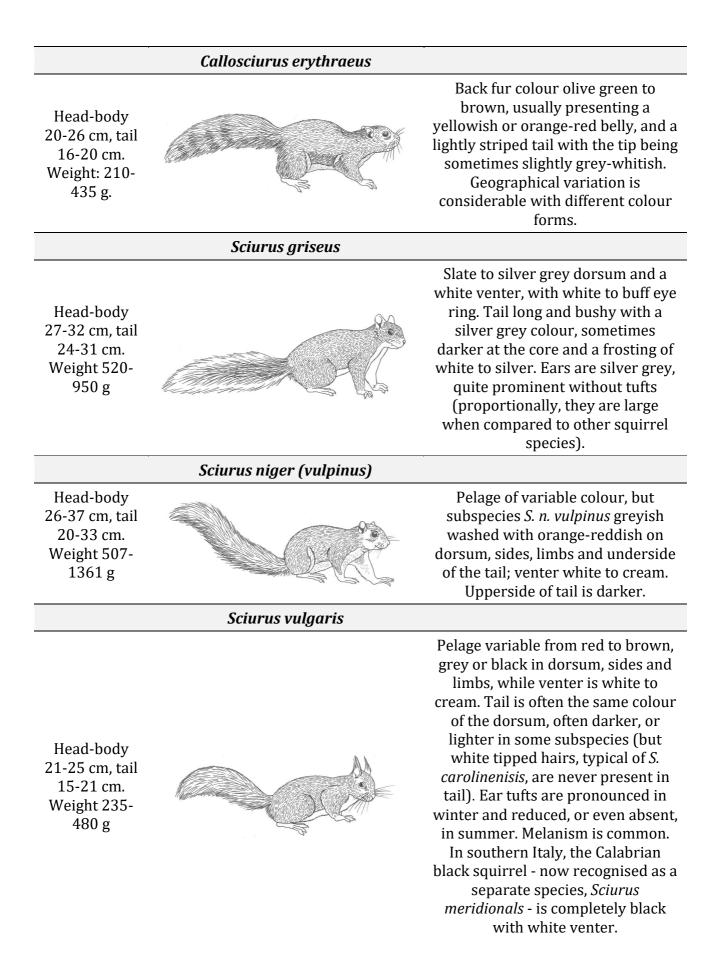
Similar species

It is difficult to distinguish *Sciurus carolinensis* from other species in the same genus; see for example, the annotated list below of some American species similar to *S. carolinensis*. However, as a remark, some of them are very unlikely to be traded because they are localized or endangered.

- *Sciurus griseus* (western gray squirrels) which is 50% larger, primarily silver grey with little if any brown visible in the pelage and large ears.
- *Sciurus arizonensis* (Arizona gray squirrel) which is also 50% larger but difficult for most to distinguish. This is a very uncommon species from small remote areas of desert mountains and would not be likely to be confused.
- *Sciurus alleni* (Allen's squirrel) is also a large grey squirrel restricted to small areas of Mexico.
- *Sciurus aureogaster* (Red-bellied squirrel but often called Mexican grey squirrel). This species is native to Guatemala e Mexico and invasive in islands off of Florida, USA. It has a grey morph that has patches of reddish on the haunches and often the underside.
- *Sciurus niger vulpinus* (Delmarva fox squirrel) is a protected (recently downlisted from endangered) subspecies of fox squirrel *(Sciurus niger)* that is a silver grey with a white underside. It is >50% larger than eastern grey squirrels.

Below, some diagnostic features are reported/illustrated for a selection of the most representative species which may be found in trade, and which are considered similar to *Sciurus carolinensis*. The list may be much longer, but squirrels with different sized and different shaped heads (e.g. pointy nose) were not considered here. NB: weight and dimension are indicative only, as they generally refer to a sample of animals and do not cover the complete possible range.





Common names

BG	Сива катерица
HR	Američka siva vjeverica
CS	Veverka popelavá
DA	Gråt egern
NL	Grijze eekhoorn
EN	Eastern Gray Squirrel
ET	Hallorav
FI	Harmaaorava
FR	Écureuil gris de Caroline
DE	(Chinesisches) Grauhörnchen
EL	Γκρίζος σκίουρος
HU	Szürke mókus

GA	Iora glas
IT	Scoiattolo grigio americano
LV	Pelēkā vāvere
LT	Pilkoji voverė
МТ	-
PL	Wiewiórka szara
РТ	Esquilo-cinzento
RO	Veveriță cenușie
SK	Veverica sivá
SL	Siva veverica
ES	Ardilla de las Carolinas
SV	Gråekorre

Key references

Global Invasive Species Database. 2018. Species profile: *Sciurus carolinensis*. Downloaded from http://www.iucngisd.org/gisd/speciesname/Sciurus+carolinensis on 29-08-2018.

Thorington, R.W., Koprowski, J.L., Steele, M.A. and Whatton, J.F. 2012. *Squirrels of the world*. Baltimore, MD, United States: The Johns Hopkins University Press.