



Guide 2: Identification of invasive alien species of Union concern during customs controls

Contents

THE ALLIGATOR WEED (<i>ALTERNANTHERA PHILOXEROIDES</i>).....	1
THE PALLAS'S SQUIRREL (<i>CALLOSCIURUS ERYTHRAEUS</i>).....	6
THE CHILEAN RHUBARB (<i>GUNNERA TINCTORIA</i>).....	11
THE PARROT'S FEATHER (<i>MYRIOPHYLLUM AQUATICUM</i>).....	17
THE BROADLEAF WATERMILFOIL (<i>MYRIOPHYLLUM HETEROPHYLLUM</i>).....	22
THE SPINYCHEEK CRAYFISH (<i>ORCONECTES LIMOSUS</i>).....	27
THE FOUNTAIN GRASS (<i>PENNISTEUM SETACEUM</i>).....	32
THE MARBLED CRAYFISH (<i>PROCAMBARUS FALLAX F. VIRGINALIS</i>).....	37
THE GREY SQUIRREL (<i>SCIURUS CAROLINENSIS</i>).....	42
THE SIBERIAN CHIPMUNK (<i>TAMIAS SIBIRICUS</i>).....	47

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of the following information.

Luxembourg: Publications Office of the European Union, 2020

© European Union, 2020

Reuse is authorised provided the source is acknowledged.

The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

PDF ISBN 978-92-76-17449-3 doi:10.2779/89144 KH-04-20-157-EN-N

Getting in touch with the EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696 or
- by email via: https://europa.eu/european-union/contact_en

Finding information about the EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications at: <https://publications.europa.eu/en/publications>

Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: <http://eur-lex.europa.eu>

Open data from the EU

The EU Open Data Portal (<http://data.europa.eu/euodp/en>) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

Cover photos: The Chilean rhubarb. © Dick Culbert. CC BY 2.0.; The Siberian chipmunk. © Frank Vassen. CC BY 2.0.; The spinycheek crayfish. © Keskkonnavahk. CC BY-SA 4.0.; The parrot's feather. © JM Dufour-Dror.

Photos are copyrighted and cannot be re-used without the permission of the provider.

Text: Riccardo Scalerà, Johan van Valkenburg, Sandro Bertolino, Elena Tricarico, Katharina Lapin

Illustrations: Massimiliano Lipperi, Studio Wildart

This technical note has been drafted by a team of experts under the supervision of IUCN within the framework of the contract no 07.0202/2016/739524/SER/ENV.D.2 "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. Reuse is authorised provided the source is acknowledged. For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

Your feedback is important. Any comments that could help improve this document can be sent to ENV-IAS@ec.europa.eu



The alligator weed is characterized by whitish, papery flowers along its short stalks. © National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Public domain.

Species ID	
Kingdom	Plantae
Division	Magnoliophyta
Class	Dicotyledoneae
Order	Caryophyllales
Family	Amaranthaceae
Genus	<i>Alternanthera</i>
Species	<i>Alternanthera philoxeroides</i>

General description

Emergent stoloniferous aquatic perennial herb with prostrate, sprawling, floating hollow stems that form a dense tangled mass throughout the water body (usually rooted in shallow water but occasionally free-floating), with stems that grow up to 60 cm out of the water when the plant flowers. Flowers on a stalk. Rooting at nodes.

Size

Plants up to 60 cm tall, floating stems may extend up to 15 meters long.

The alligator weed (*Alternanthera philoxeroides*)

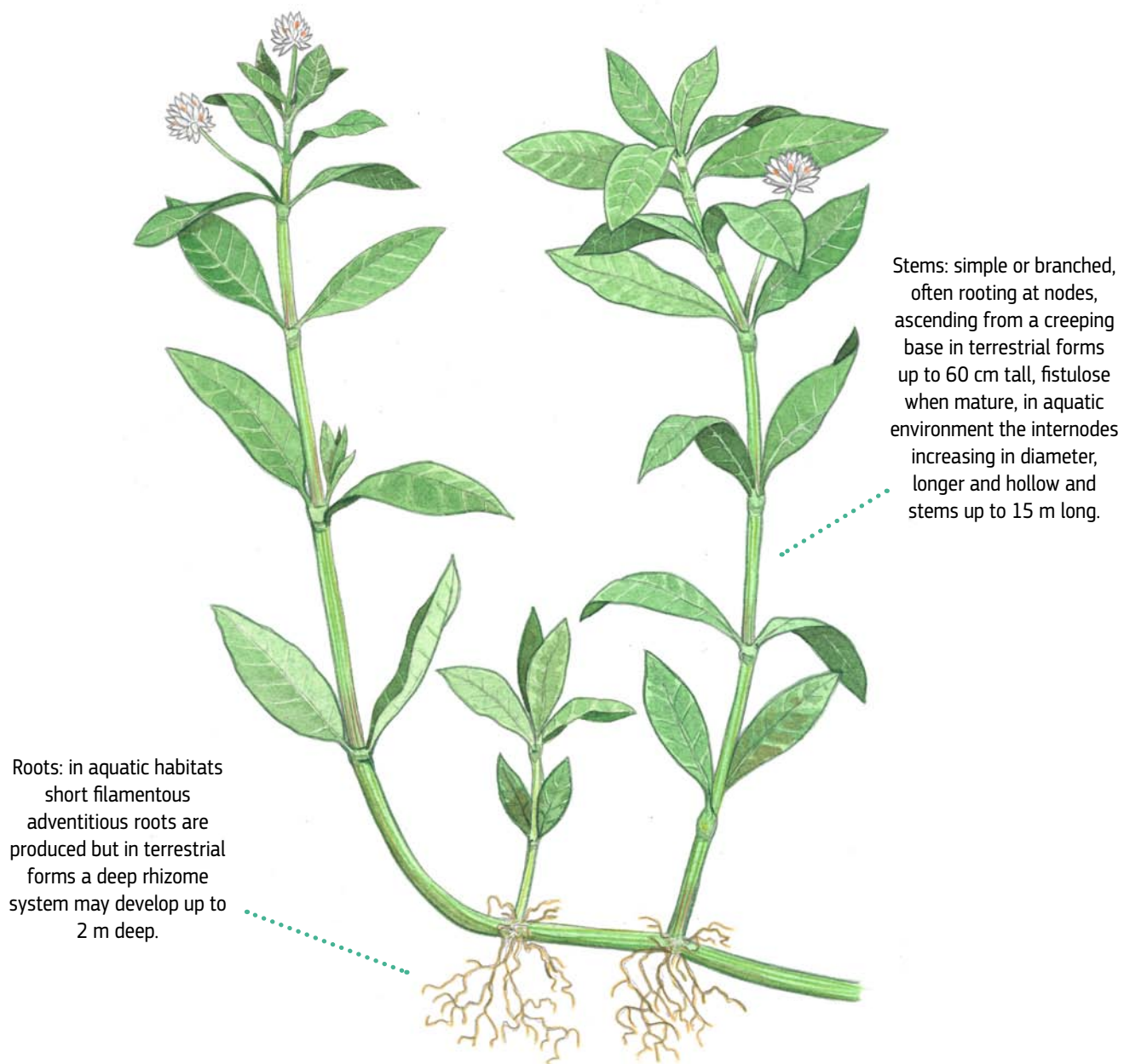
Support for customs on the identification of invasive alien species of Union concern

Common names

BG	–
HR	Aligatorski korov
CZ	Plevuňka (philoxeroides)
DA	Alligator-urt
NL	Alligatorkruid
EN	Alligator weed
ET	Vesi-kõlupea
FI	Vesikajalehti
FR	Alligatorweed
DE	Alligatorkraut
EL	–
HU	Aligátorfű
IE	–
IT	Erba degli alligatori
LV	–
LT	Sausalapė
MT	–
PL	–
PT	Erva-de-jacaré
RO	–
SK	Papagájovec
SL	Aligatorska alternantera
ES	Lagunilla
SV	–

Disclaimer: For the correct identification of the species the advice of an expert is required.

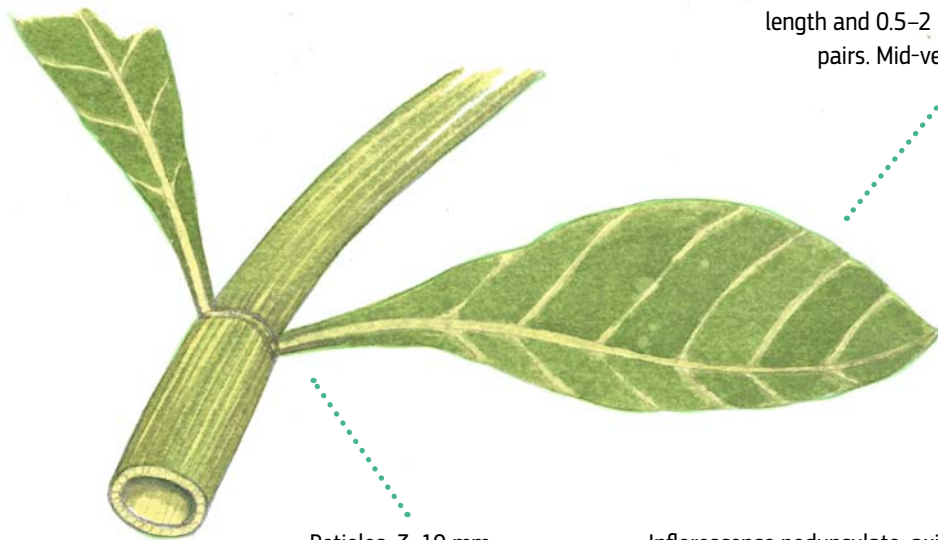
Distinctive characteristics



The plant flowers from December to April and usually grows around 13 mm in diameter and tend to be papery and ball-shaped. © Harry Rose. CC BY 2.0.



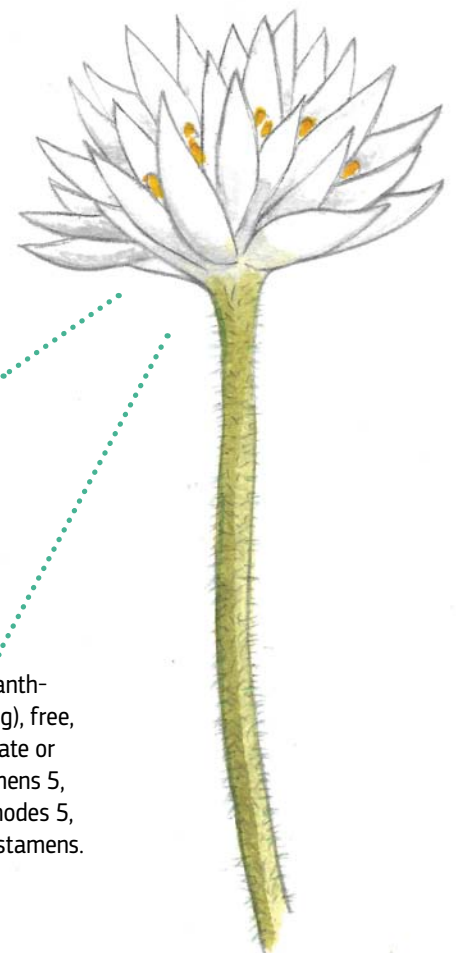
The weed's intricate root system can either allow them to hang free in the water to absorb nutrients or directly penetrate the soil/sediment and pull their nutrients from below. © Harry Rose. CC BY 2.0.



Petioles: 3–10 mm long, glabrous or slightly hairy.

Leaves: bright green, ovate-lanceolate (2) 3.5–7(10) cm in length and 0.5–2 cm wide, petiolate, arranged in opposite pairs. Mid-vein prominent on both sides of leaf.

Inflorescence pedunculate, axillary, heads globose 0.8–1.7 mm in diameter, bracts (1) and bracteoles (2) persistent, membranous, 1-veined, white. Bracts not keeled, ovate, 2–2.5 mm; bracteoles about 2 mm long.



Flowers: bisexual, perianth-segments 5 (5–6 mm long), free, shiny, glabrous, lanceolate or oblong, apex acute, stamens 5, alternating pseudostaminodes 5, ligulate, about as long as stamens.

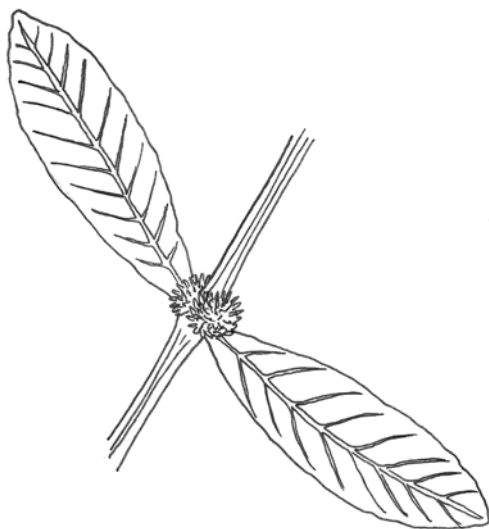
Similar species

Alternanthera philoxeroides can be confused with a number of semi-aquatic species, in particular the closely related congeners: *Alternanthera caracasana* (L.) Sw., and *Alternanthera sessilis* (L.) R.Br. ex DC. Other related species are: *Alternanthera peploides* (Humb. & Bonpl.) Urb. and *Alternanthera pungens* Kunth. Additional species used within the aquatic plant trade are *Alternanthera aquatica* (Parodi) Chodat, and numerous cultivars of *Alternanthera reineckii* Briq.

Details on the key congeners in trade *Alternanthera sessilis* and *A. reineckii* is provided below, along with those for other similar species such as *Ludwigia palustris* and *Ludwigia repens* that are common in the aquarium trade and also have opposite leaves.

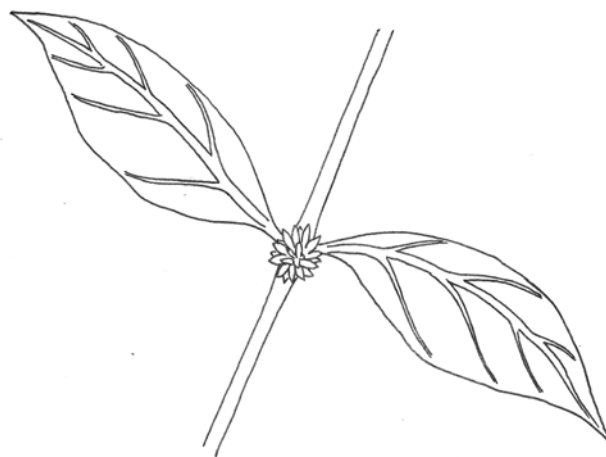
Alternanthera sessilis

Annual species whose clusters of flowers are sessile in the leaf axils, not on peduncles. Leaves 6–9(15) cm long depending on development stage.



Alternanthera reineckii

Perennial amphibious species, several forms are known, the most common in trade being characterised by pink or purple leaves about 10 cm long.



Ludwigia palustris

Perennial plant with opposite leaves 3–5 cm long, and solitary sessile flowers lacking petals in the leaf axils.



Ludwigia repens

Perennial polymorphic species with opposite oval leaves 4–5 cm long, and solitary flowers with tiny petals in the leaf axils.



Key references

- CABI (2017). *Alternanthera philoxeroides* (alligator weed) [original text by Julissa Rojas-Sandoval]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <https://www.cabi.org/isc/datasheet/4403> (Access Date: 01/11/2017)
- EPPO (2016). *Alternanthera philoxeroides* (Mart.) Griseb. Bulletin OEPP/EPPO Bulletin, 46 (1), 8–13. <https://gd.eppo.int/taxon/ALRPH>
- GISD (2017) Species profile: *Alternanthera philoxeroides*. Downloaded from <http://www.iucngisd.org/gisd/species.php?sc=763> on 01/11/2017
- Thayer, D.D. and Pflingsten, I.A. (2017). *Alternanthera philoxeroides* (Mart.) Griseb.: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL. <https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=227>, Revision Date: 5/16/2016, Access Date: 01/11/2017
- http://www.sms.si.edu/irlspec/alternanthera_philoxeroides.htm (Access Date: 01/11/2017)
- <http://www.q-bank.eu/Plants/BioloMICS.aspx?Table=Plants%20-%20Species&Rec=931&Fields=All> (Access Date: 01/11/2017)
- <http://www.theplantlist.org/tpl1.1/record/kew-2631346> (Access Date: 01/11/2017)



The geographic range of this invasive species can easily be expanded by any means, due to its ability to regenerate from practically nothing. © Harry Rose. CC BY 2.0.



A Pallas's squirrel can grow between 20 and 26cm © LiCheng Smith. CC BY 2.0.

Species ID	
Kingdom	Metazoa
Division	Chordata
Class	Mammalia
Order	Rodentia
Family	Sciuridae
Genus	<i>Callosciurus</i>
Species	<i>Callosciurus erythraeus</i>

General description

Squirrel with back fur colour olive green to brown, usually presenting a yellowish or orange red belly, and a lightly striped tail with the tip being sometimes slightly grey whitish. Geographical variation is considerable with different colour forms.

Size

Head-body length of 20–26 cm, tail length of 16–20 cm. Weight: 210–435 g.

The Pallas's squirrel (*Callosciurus erythraeus*)

Support for customs on the identification of invasive alien species of Union concern

Common names

BG	Катерица на Палас
HR	Pallasova vjeverica
CZ	Veverka Pallasova
DA	Rødbuget egern
NL	Pallas' eekhoorn
EN	Pallas's squirrel
ET	Puna-kabeorav
FI	Oliiviselkäorava
FR	Écureuil à ventre rouge
DE	Pallashörnchen
EL	Σκίουρος του Pallas
HU	Csinos tarkamókus
IE	–
IT	Sciattolo di Pallas
LV	Sarkanvēdera krāšņvāvere
LT	Palaso voverė
MT	–
PL	Wiewiórczak rdzawobrzuchy
PT	Esquilo-de-Pallas
RO	–
SK	Veverica červenková
SL	Pallasova veverica lepotka
ES	Ardilla de Pallas
SV	Rödماغad trädekorre (pallasekorre)

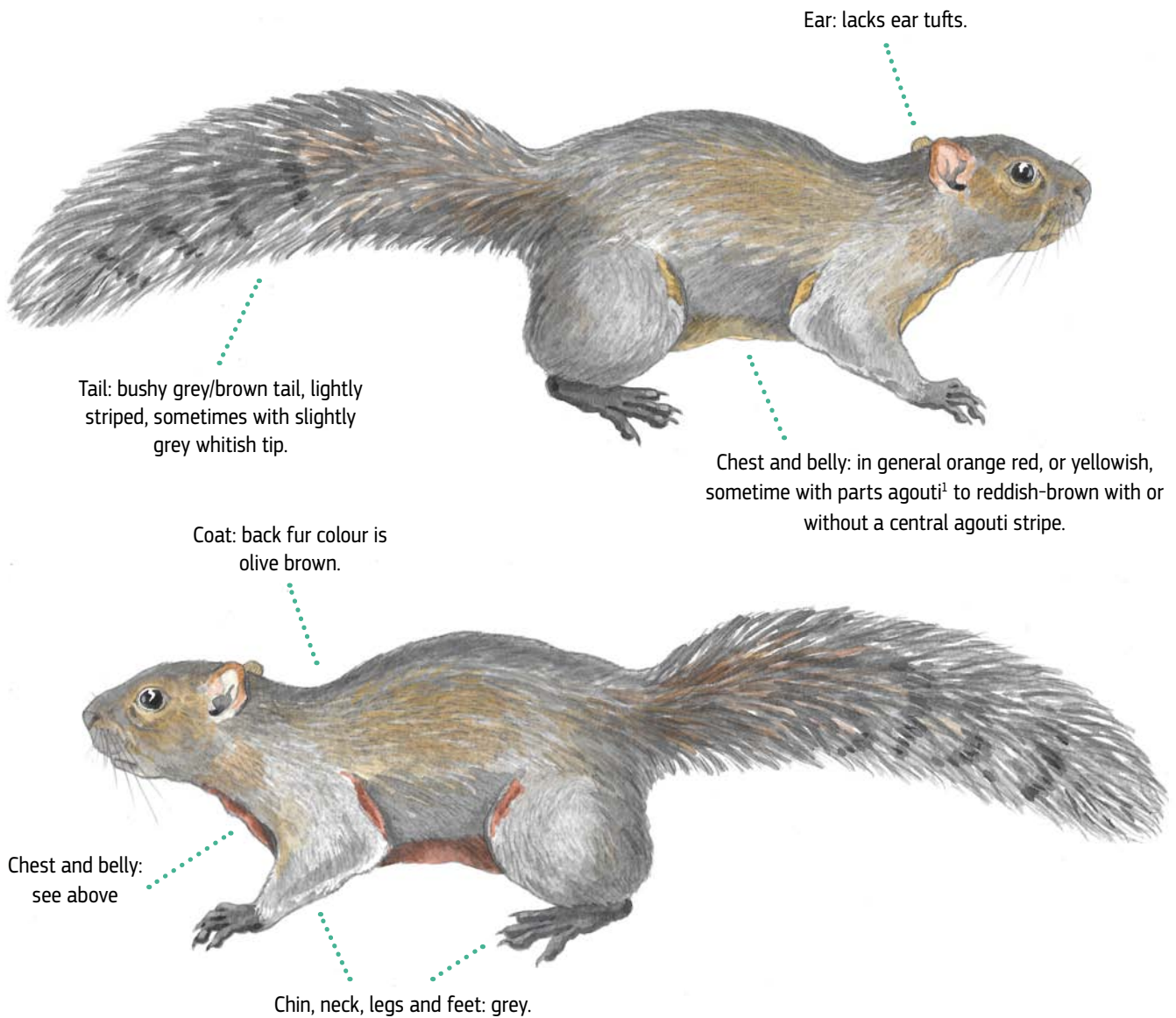
Disclaimer:

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.



The Pallas's squirrel has a bushy tail with sometimes a slightly grey whitish tip. © LiCheng Smith. CC BY 2.0

Distinctive characteristics







1 Agouti: greyish colour with a brindled appearance

Similar species

It is difficult to distinguish *C. erythraeus* from other species in the same genus; for example, some forms have the entire ventral pelage agouti¹ as in *C. caniceps*, and some have a reddish brown dorsum as in some types of *C. finlaysonii*. None of the species in this genus have ear tufts in any season.

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 *C. erythraeus*. The list may be much longer, but squirrels of different size and different shape of the head (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.

Size		Colour
<i>Callosciurus canicep</i>		
<ul style="list-style-type: none"> • Head-body 21–23 cm, tail 22–24 cm. • Weight 260–320 g 		The belly is usually grey, sometimes reddish. Upperparts olive-brown to reddish.
<i>Callosciurus pygerythrus</i>		
<ul style="list-style-type: none"> • Head-body 18–21 cm, tail 15–18 cm. • Weight about 250 g 		Dark olive brown dorsally, tail often with a black tip. Ventral pelage from bluish grey to cream and orange.
<i>Sundasciurus hippurus</i>		
<ul style="list-style-type: none"> • Head-body 21–25 cm, tail 23–29 cm. • Weight 260–435 g 		Shoulders and sides are grey-black, head is always grey. The upperparts are reddish brown to chestnut. The tail is glossy black or grey and black banded. Subspecies differ, the hind legs may be grey or reddish brown and the underside is whitish, dull orange, or reddish brown.
<i>Heliosciurus rufobrachium</i>		
<ul style="list-style-type: none"> • Head-body 22–23 cm, tail 24–28 cm. • Weight 290–310 g 		Dark brown or greyish coat, red-tinged legs, thin tail banded with yellow and black rings.

Within the Sciurid family, Wilson & Reeder (2005) consider 15 species in the genus *Callosciurus*, all coming from Southeast Asia: *C. adamsi*, *C. albescens*, *C. baluensis*, *C. caniceps*, *C. erythraeus*, *C. finlaysonii*, *C. inornatus*, *C. melanogaster*, *C. nigrovittatus*, *C. notatus*, *C. orestes*, *C. phayrei*, *C. prevostii*, *C. pygerythrus*, *C. quinquestriatus*.

Twenty-six subspecies of *Callosciurus erythraeus* are known in the native range (Wilson & Reeder, 2005).

Callosciurus erythraeus is highly variable in fur colour and body measurements and, so far, only morphological characters have been used to describe and differentiate the 26 subspecies (Wilson and Reeder, 2005). For instance, recent molecular analyses suggested that the subspecies *Callosciurus erythraeus griseimanus* is genetically distinct from other *C. erythraeus* subspecies and other *Callosciurus* species (Oshida *et al.*, 2013). In Thailand, *C. erythraeus* and *C. finlaysonii* (another *Callosciurus* species) form a

complex consisting of seven divergent genetic groups; pelage colour did not consistently correspond to these genetic groups (Boonkhaw *et al.*, 2017). Therefore, there is the need for a more extensive review of all putative subspecies of *C. erythraeus* and other similar species with modern molecular techniques.

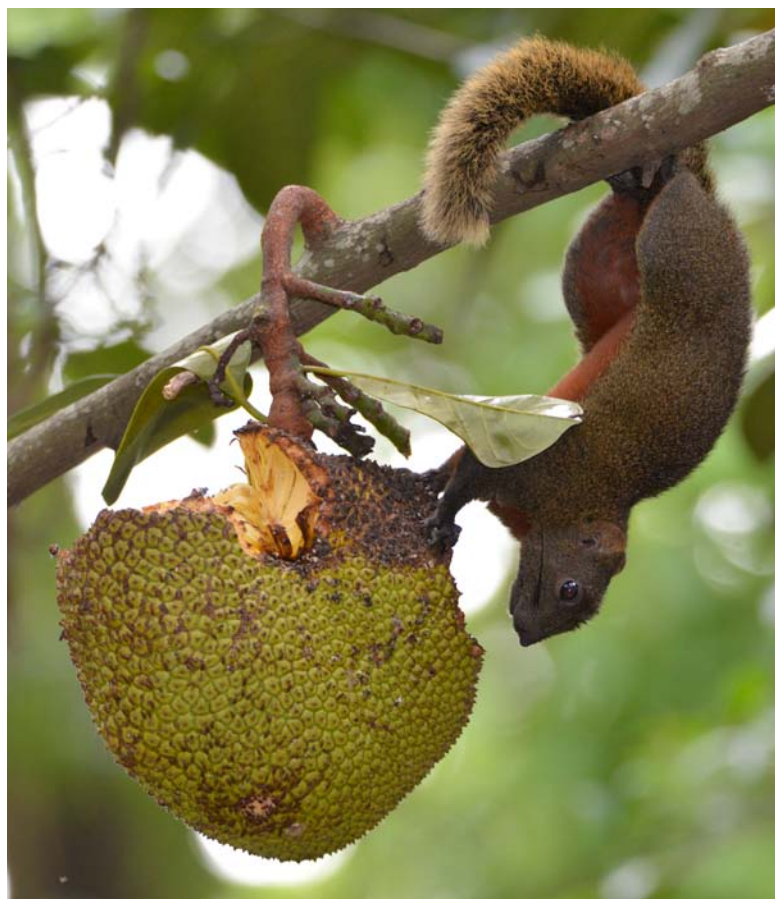
Callosciurus erythraeus was introduced in Europe in Belgium, France and Italy. Squirrels collected in Italy and Belgium share the same haplotypes and skull characteristics, but are conspicuously different from the French population. Genetic data revealed close similarity between French squirrels and *C. erythraeus* from Taiwan, China. On the other side, Italian and Belgian squirrels are morphologically similar to known specimens assigned to *C. erythraeus* but formed an independent taxonomic lineage in genetic analyses, whose taxonomic rank needs further investigation (Mazzamuto *et al.*, 2016).

A Pallas's squirrel ears are distinctive as they lack ear tufts. © LiCheng Smith. CC BY 2.0



Key references

- Boonkhw, P., Prayoon, U., Kanchanasaka, B., Hayashi, F. and Tamura, N. (2017). Colour polymorphism and genetic relationships among twelve subspecies of *Callosciurus finlaysonii* in Thailand. *Mammalian Biology – Zeitschrift für Säugetierkunde*. doi:dx.doi.org/10.1016/j.mambio.2017.02.001.
- CABI (2017). *Callosciurus erythraeus* (Pallas's squirrel) [original text by Noriko Tamura]. In: *Invasive Species Compendium*. Wallingford, UK: CAB International. <https://www.cabi.org/isc/datasheet/91200> (Access Date: 01/11/2017)
- Mazzamuto, M. V., Galimberti, A., Cremonesi, G., Pisanu, B., Chapuis, J.-L., Stuyck, J., Amori, G., Su, H., Aloise, G., Preatoni, D. G., Wauters, L. A., Casiraghi, M. and Martinoli, A. (2016). Preventing species invasion: A role for integrative taxonomy? *Integrative Zoology* 11: 214–228. doi:10.1111/1749-4877.12185
- Oshida, T., Dang, C.N., Nguyen, S.T., Nguyen, N.X., Endo, H., Kimura, J., Sasaki, M., Hayashida, A., Takano, A., Koyabu, D. and Hayashi, Y. (2013). Phylogenetic Position of *Callosciurus erythraeus griseimanus* from Vietnam in the Genus *Callosciurus*. *Mammal Study* 38:41–17. doi:10.3106/041.038.0105
- 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.
- Wilson, D.E. and Reeder, D.M. (2005). *Mammal Species of the World: A Taxonomic and Geographic Reference*. JHU Press.



The back fur coat of a Pallas's squirrel is an olive brown colour.

© LiCheng Smith. CC BY 2.0



The Chilean rhubarb is a large-leaved plant that grows to more than two metres tall. © Stan Shebs. CC BY-SA 3.0.

Species ID	
Kingdom	Plantae
Division	Magnoliophyta
Class	Angiosperm
Order	Gunnerales
Family	Gunneraceae
Genus	<i>Gunnera</i>
Species	<i>Gunnera tinctoria</i>

General description

Deep-green herbaceous, deciduous, clump-forming, perennial plant with thick, wholly rhizomatous stems producing umbrella-sized, orbicular or ovate leaves on stout petioles. Inflorescence with relatively compact branches, emerging leaf with scales at base.

Size

Usually up to 2 m in height, depending on local growth conditions plants may attain 3 m, leaf lamina 30–200 cm in diameter.

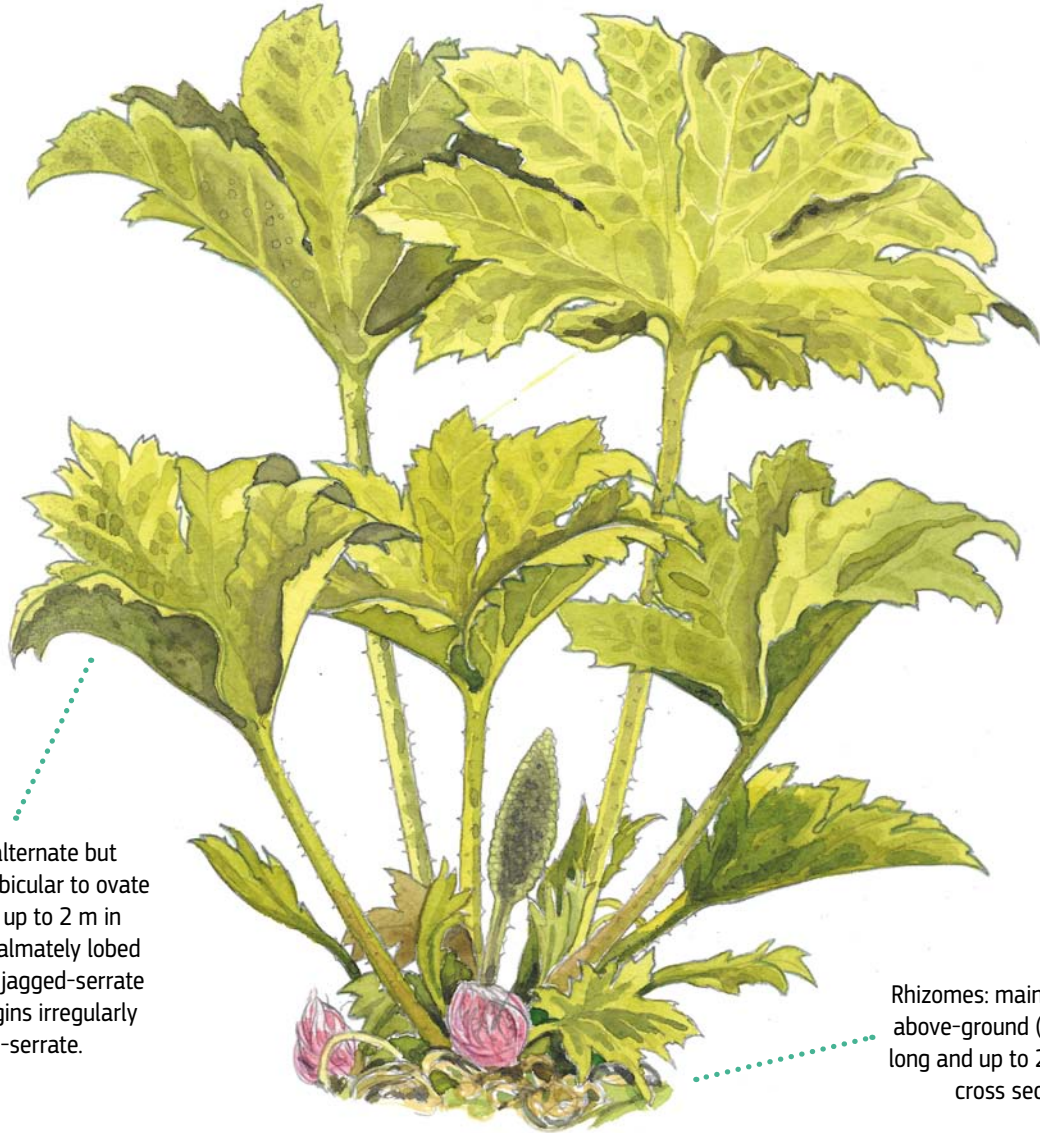
The Chilean rhubarb (*Gunnera tinctoria*)

Support for customs on the identification of invasive alien species of Union concern

Common names

BG	–
HR	Čileanska gunera
CZ	Batora chilská
DA	Farvegunnera
NL	Gewone gunnera
EN	Chilean rhubarb
ET	Tšiili gunnera
FI	Värigunnera
FR	Rhubarbe géante du Chili
DE	Chilenischer Riesenrhabarber
EL	–
HU	Chilei óriáslapu
IE	Gunnaire
IT	Rabarbaro gigante
LV	Krāsu gunnera
LT	Čilinė gunera
MT	–
PL	Gunera brazylijska
PT	Gigante
RO	–
SK	Gunera farbiarska
SL	Čilenska gunera
ES	Nalca
SV	Röd jättegunnera

Distinctive characteristics



Leaves: alternate but clustered, orbicular to ovate in outline up to 2 m in diameter, palmately lobed with 5–7(9) jagged-serrate lobes, margins irregularly incise-serrate.

Rhizomes: mainly occurring above-ground (up to 3.5 m long and up to 20–25 cm in cross section).

The Chilean rhubarb. © Archive of Institute Symbiosis.

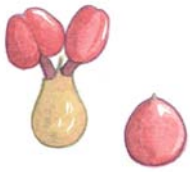




Inflorescences in a Chilean rhubarb. © Archive of Institute Symbiosis.

Flowers: tiny green female or hermaphrodite densely packed on the inflorescence branches, sessile, apetalous, with minute sepals, about 1 mm long.

Fruit: A single seeded drupe, reddish, oblong, 1.5–2 mm long.

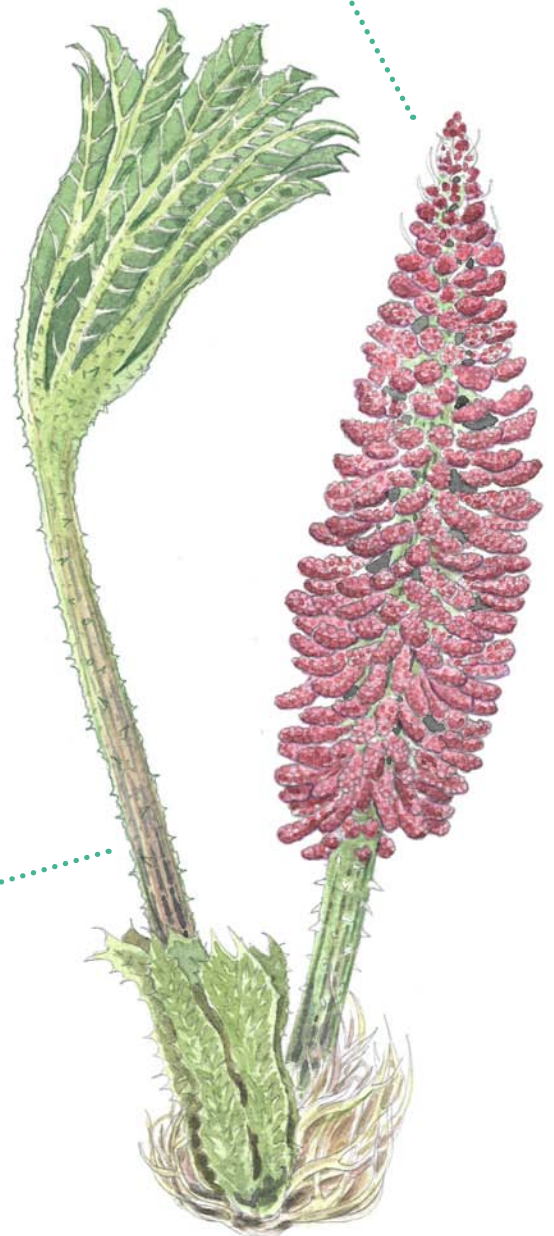


Buds (over-wintering): covered in pinkish, pinnatisect scales that are up to 25 cm long.



Inflorescences: A panicle up to 1 m long, with relatively stout branches up to 8 cm.

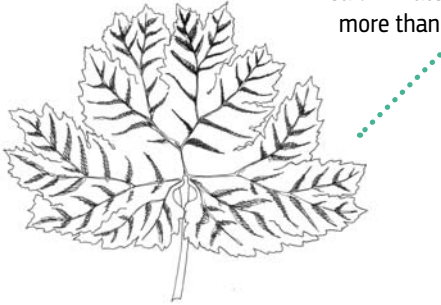
Petiole: up to 2 m long, with numerous small, conical spines.



Similar species

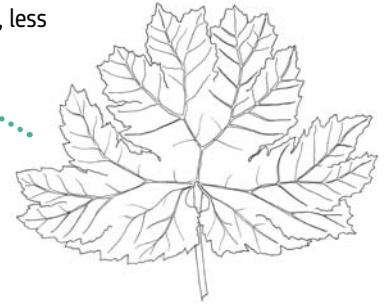
Giant rhubarb *Gunnera manicata*

Leaf: Pinnately lobed, often more than 2 m across.



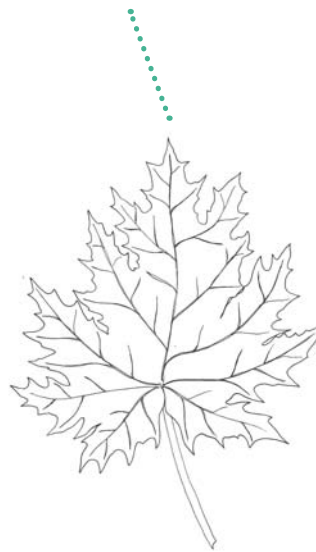
Chilean rhubarb *Gunnera tinctoria*

Leaf: Palmately lobed, less than 2 m across.



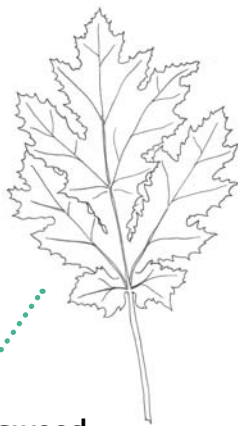
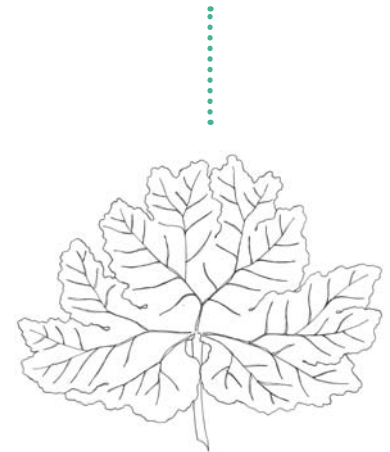
Ornamental rhubarb *Rheum palmatum*

Leaf: Palmately lobed, up to 1 m across.



Cultivated rhubarb *Rheum x hybridum*

Leaf: Not strongly lobed, up to 1 m across.



Giant hogweed *Heracleum mantegazzianum*

Leaf: More divided and lobed, up to 2.5 m across.

The Ornamental rhubarb (*Rheum palmatum*) can be confused with the Chilean rhubarb. © Alexander Klink. CC BY 4.0.



Giant rhubarb

Gunnera manicata

Key features compared to *Gunnera tinctoria*

- Size: taller
- Leaves: larger, often more than 2 m, and pinnately lobed (rather than palmately lobed).
- Petiole/stalk: up to 2 m long
- Rhizome: thicker and more massive
- Flowers (old): green rather than reddish-brown
- Main inflorescence axis: narrower diameter of the central part (3–3.3 vs. 4–4.5 cm for *Gunnera tinctoria*)
- Inflorescence branches: longer (9.5–11 vs. 5–7 cm) but with a narrower diameter (3–4 vs. 5–7 mm)
- Inflorescences: more open inflorescences (less so in *Gunnera tinctoria*), but these differences between the two species may be small.



The Giant rhubarb (*Gunnera manicata*) can be distinguished from the Chilean rhubarb by its leaves. Kurt Stueber. CC BY-SA 3.0.

Giant hogweed

Heracleum mantegazzianum

Distinctive tall inflorescence stalk with large umbrella-like clusters of greenish-white flowers. It has a ridged and sparsely hairy axis over 2 m high, with purple blotches. Leaves of adult specimens are very large (over 1,5 m in diameter), slightly hairy below and deeply incised, with short rounded teeth in the margin.



The Giant hogweed (*Heracleum mantegazzianum*) is native to the western Caucasus region of Eurasia. Fritz Geller-Grimm. CC BY-SA 3.0.

Disclaimer:

The taxonomy of *Gunnera tinctoria* and the related *G. manicata* is somewhat unclear. Typification of the names of the plants introduced to Europe in the 19th century has been somewhat problematic. The selection for garden plants for over a century has given rise to seemingly intermediate forms. While there may be an intermediate form of these two species or a hybrid, there are no records or evidence to verify this.

The diagnostic features to distinguish *Gunnera tinctoria* from *G. manicata* are only visible when plants are fully developed and flowering / fruiting. There is big confusion concerning what species are actually in trade. The optimal approach for correct identification could be a combination of macromorphology and the development of a DNA barcode.

Key references

CABI (2017). *Gunnera tinctoria* (giant rhubarb) [original text by Charlie Riches]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <http://www.cabi.org/isc/datasheet/107826> (Access Date: 01/11/2017)

GB Non-native Species Secretariat (Kevin Doidge, Max Wade, Vicky Ames and Kelly McKee of RPS). Giant-rhubarbs. <https://secure.fera.defra.gov.uk/nonnativespecies/downloadDocument.cfm?id=371> (Access Date: 01/11/2017)

<http://www.q-bank.eu/Plants/BioloMICS.aspx?Table=Plants%20-%20Species&Rec=978&Fields=All> (Access Date: 01/11/2017)

<http://www.theplantlist.org/tpl1.1/record/kew-370468> (Access Date: 01/11/2017)

O'Rourke E. and O'Flynn, C. (2016). Risk Assessment of *Gunnera tinctoria* – submission for consideration of Union listing under EU IAS Regulation No. 1143/2014

Williams, P.A., Ogle, C.C., Timmins, S.M., La Cock, G.D. & Clarkson, J. (2005). Chilean rhubarb (*Gunnera tinctoria*): biology, ecology and conservation impacts in New Zealand. Department of Conservation, Wellington.



The Chilean rhubarb has cone-shaped inflorescences (to 1m) from spring to early summer, with small flowers. © Dick Culbert. CC BY 2.0.



The parrot's feather is an aquatic or amphibious plant green in colour. © JM Dufour-Dror (location of image: Israel, Upper Galilee).

Species ID	
Kingdom	Plantae
Division	Tracheophyta
Class	Spermatopsida
Order	Saxifragales
Family	Haloragidaceae
Genus	<i>Myriophyllum</i>
Species	<i>Myriophyllum aquaticum</i>

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.

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.

The parrot's feather (*Myriophyllum aquaticum*)

Support for customs on the identification of invasive alien species of Union concern

Common names

BG	Воден многолистник
HR	Vodeni krocanj
CZ	Stolístek vodní
DA	Papegøjefjer
NL	Parelvederkruid
EN	Parrot's feather
ET	Brasilia vesikuusk
FI	Isoärviä
FR	Myriophylle myriophylle du Brésil
DE	Brasilianisches Tausendblatt
EL	–
HU	Strucctoll-süllőhínár
IE	Líonán cleiteach
IT	Millefoglio americano
LV	–
LT	Stambioji plunksnalapė
MT	–
PL	Wywłócznik brazylijski
PT	Pinheirinha
RO	Penița apei
SK	Stolístok vodný
SL	Brazilski rmanec
ES	Milenrama brasileño
SV	Storslinga

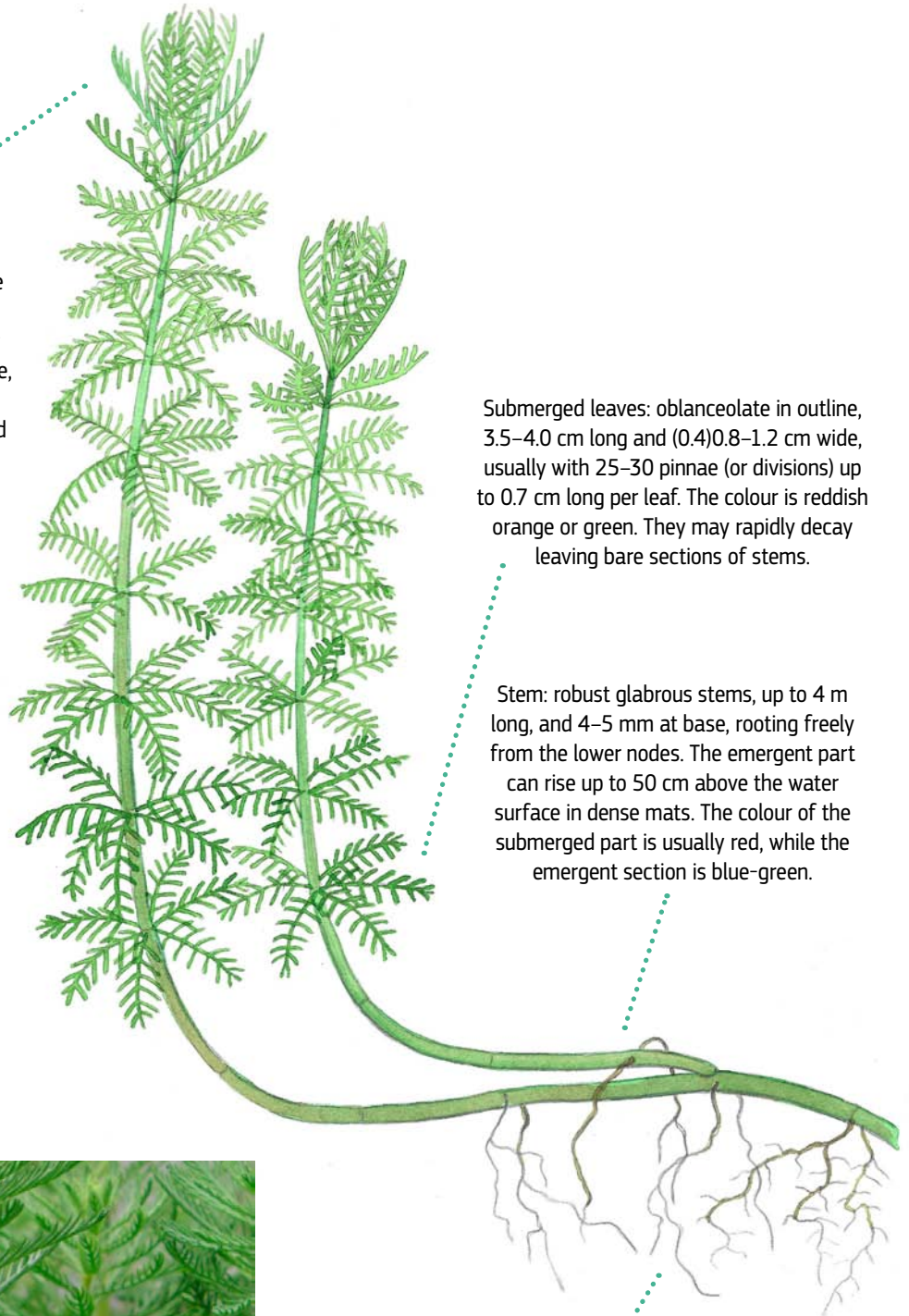
Distinctive characteristics

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.

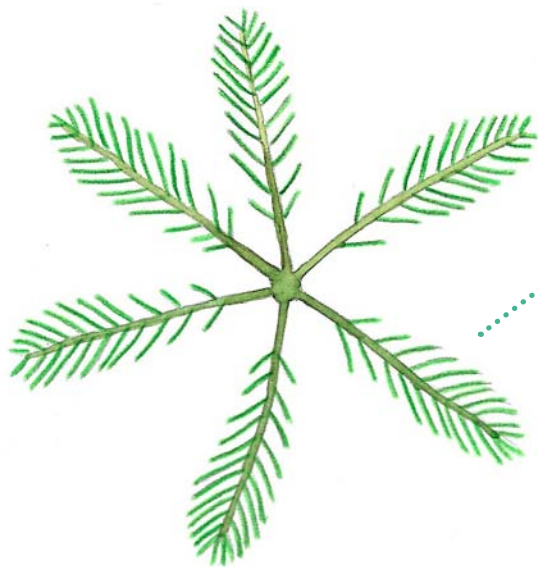
Stolon: stolons are completely submerged in winter in a temperate climate, but can sprout massively in spring.



A parrot's feathers submerged leaves are usually between 3.5 and 4.0 cm long and have a reddish orange or green colour.
© JM Dufour-Dror (location of image: Israel, Izreel Valley).



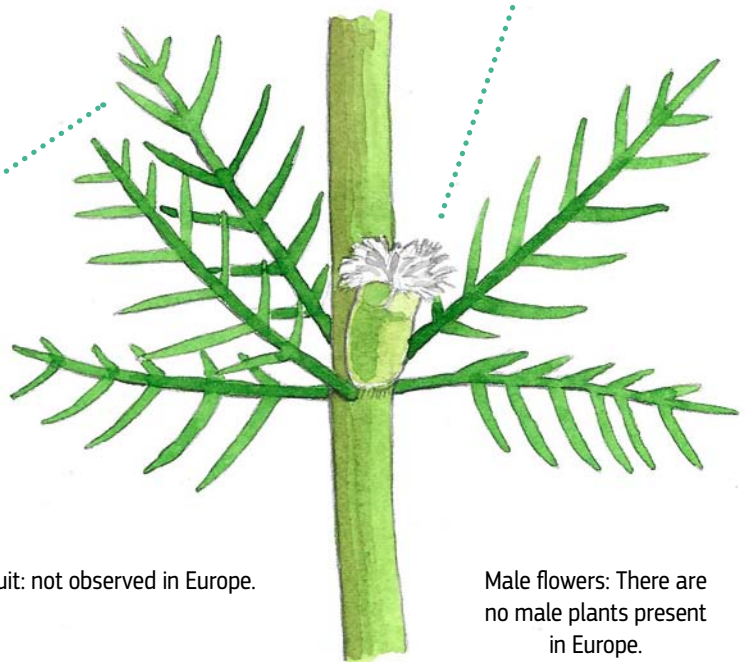
The leaves of a parrot's feather are usually densely packed upward. © JM Dufour-Dror (location of image: Israel, Upper Galilee).



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 mm long and 0.3 mm wide) and prominent stigmas with numerous fine white hairs. Petals absent. Pyriform ovary, 0.6–0.7 mm long, 0.6 mm wide, longitudinally ribbed between sepals.

Inflorescence: very small, inconspicuous, axillary, indeterminate spike with unisexual flowers just above emergent leaves, subtended by 2 bracteoles.



Fruit: not observed in Europe.

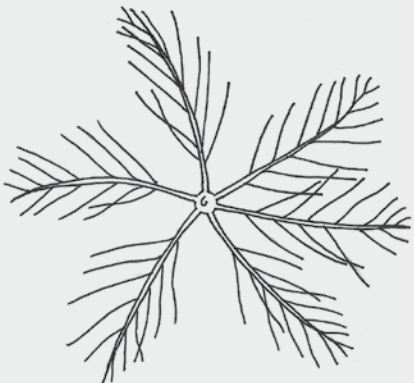
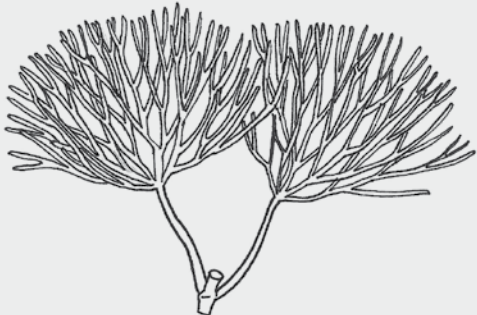
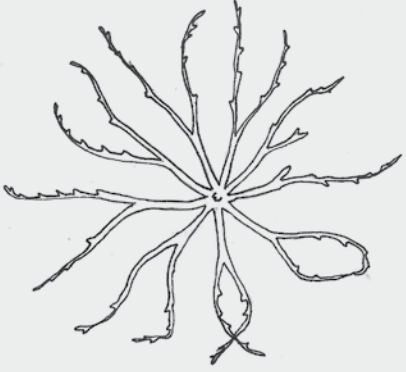



Male flowers: There are no male plants present in Europe.

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:

<p><i>Myriophyllum</i></p>	<p><i>Cabomba</i></p>
 <p>Featherlike in whorls</p>	 <p>Fan shaped</p>
<p><i>Ceratophyllum</i></p>	<p>Hydrocharitaceae ("waterpest species")</p>
 <p>2-3 times jugate</p>	 <p>Leaf arranged in whorls (not divided, not composed)</p>
<p>In trade as a potted plant <i>M. aquaticum</i> can only be confused with material that appears to be known in cultivation and is traded as "<i>Myriophyllum brasiliensis</i>" (this name however is a synonym of <i>M. aquaticum</i>).</p>	
<p><i>Myriophyllum aquaticum</i></p>	<p><i>Myriophyllum "brasiliensis"</i></p>
 <p>Flower: white Stem and leaves: blueish green (green above water) Larger dimensions in general</p>	 <p>Flower: pinkish Stem: red Leaves: green</p>

Key references

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

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.

https://www.korina.info/files/Myriophyllum_similar%20species_q-bank.pdf

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



In Europe, there are no male parrot's feather plants. © Julie Coetzee.



The broadleaf watermilfoil is a perennial evergreen submerged aquatic herb. © Leslie J. Mehrhoff, University of Connecticut. CC BY 3.0

Species ID	
Kingdom	Plantae
Division	Tracheophyta
Class	Spermatopsida
Order	Saxifragales
Family	Haloragidaceae
Genus	<i>Myriophyllum</i>
Species	<i>Myriophyllum heterophyllum</i>

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 identification may be required.

The broadleaf watermilfoil (*Myriophyllum heterophyllum*)

Support for customs on the identification of invasive alien species of Union concern

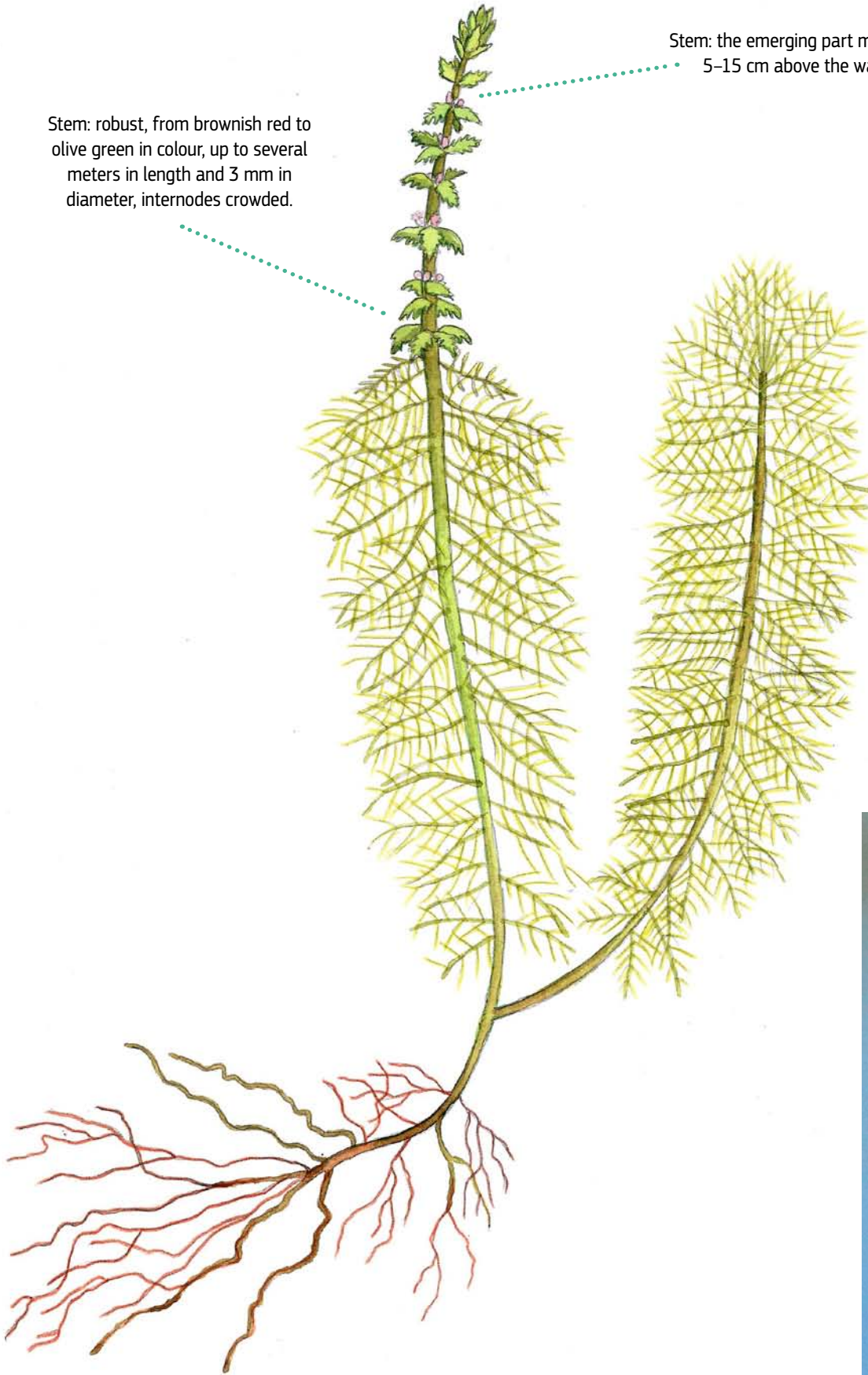
Common names

BG	Разнолистен многолистник
HR	Raznolisni krocanj
CZ	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
IE	–
IT	Millefoglio
LV	–
LT	Kaičioji plunksnalapė
MT	–
PL	Wywłócznik różnolistny
PT	–
RO	–
SK	Stolístok
SL	Raznolistni rmanec
ES	–
SV	–

Distinctive characteristics

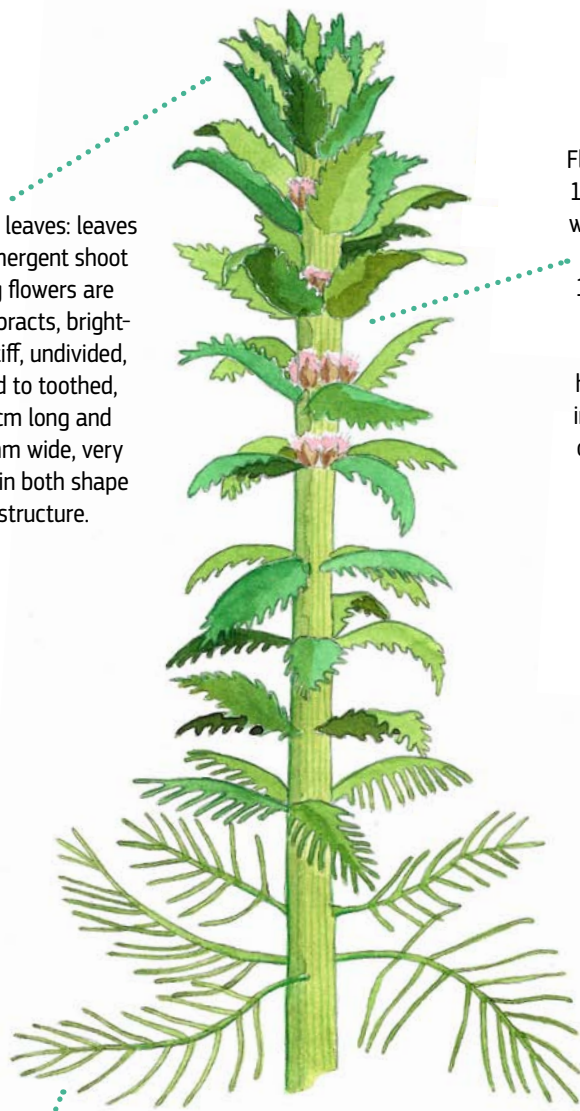
Stem: robust, from brownish red to olive green in colour, up to several meters in length and 3 mm in diameter, internodes crowded.

Stem: the emerging part may grow 5–15 cm above the water.



The upper stem's emerging part of the broadleaf watermilfoil plant may grow between 5 and 15 cm above the water. © Leslie J. Mehrhoff, University of Connecticut. CC BY 3.0

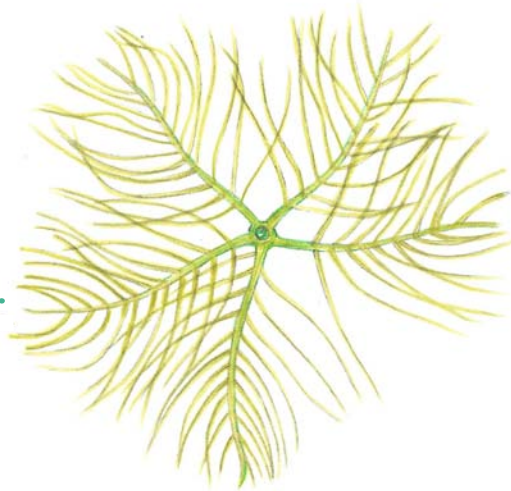
Emergent leaves: leaves in the emergent shoot bearing flowers are actually bracts, bright-green, stiff, undivided, serrated to toothed, 0.4–3 cm long and 1.5–5 mm wide, very variable in both shape and structure.



Flowers: very tiny (about 1 mm long) and grow in whorls of 4 in emergent terminal spikes of 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 divisions) per leaf.

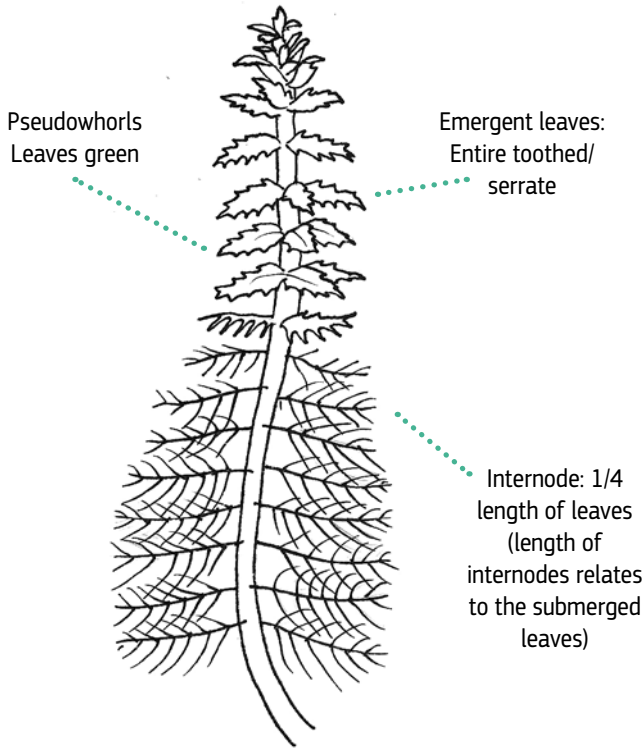


The submerged leaves of the plant are green, feather-like and pinnate, and arranged into pseudowhorls of 4–5 leaves. © Leslie J. Mehrhoff, University of Connecticut. CC BY 3.0

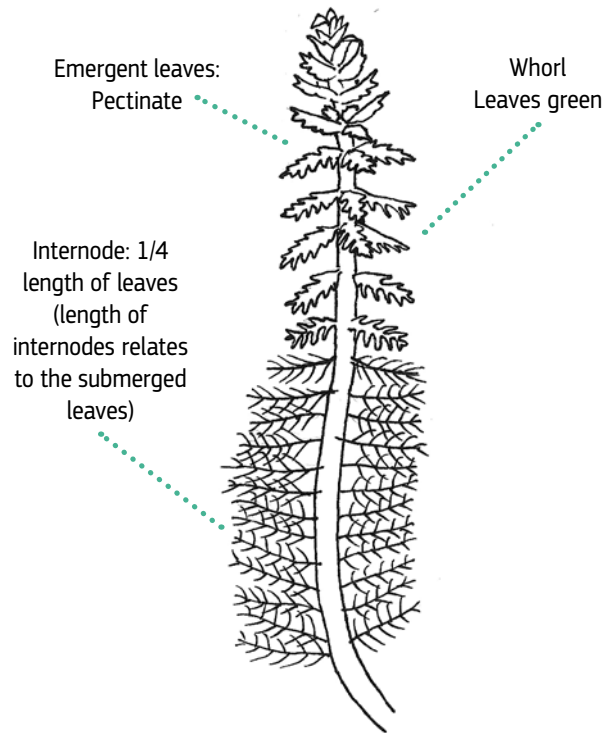


Similar species

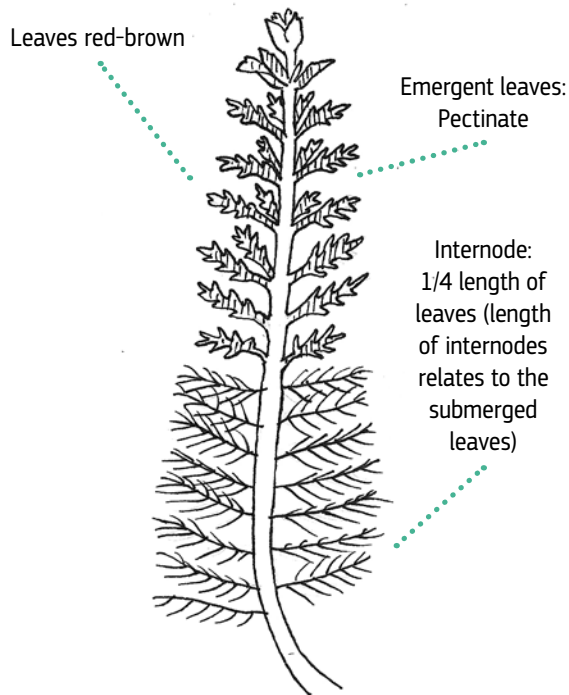
Myriophyllum heterophyllum



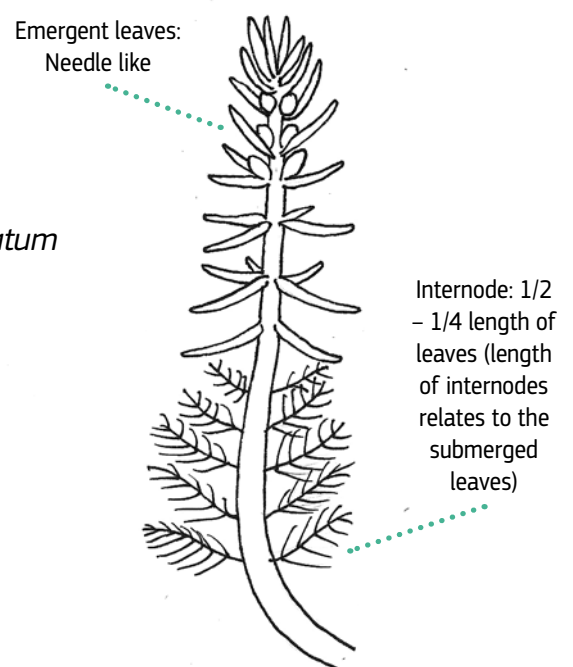
Myriophyllum tetrandrum



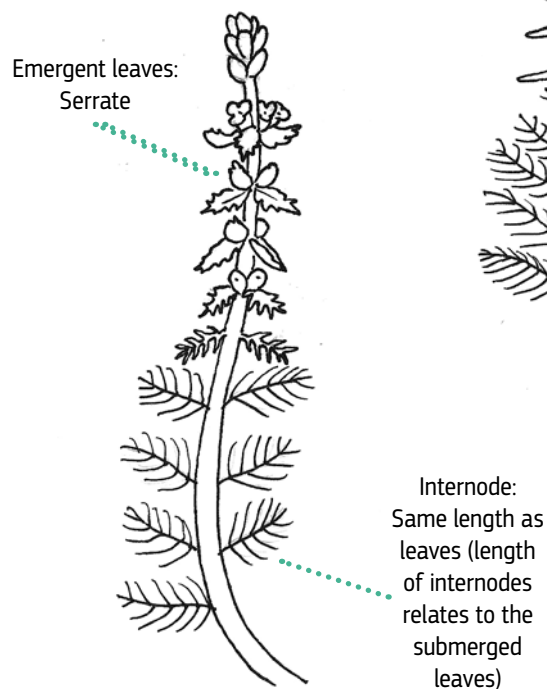
Myriophyllum tuberculatum



Myriophyllum simulans



Myriophyllum spicatum





So far in Europe only female flowers of the broadleaf watermilfoil plant, reddish in colour, have been observed. © Leslie J. Mehrhoff, University of Connecticut. CC BY 3.0.

Key references

- CABI. 2018. *Myriophyllum heterophyllum*. In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc
- https://www.korina.info/files/Myriophyllum_similar%20species_q-bank.pdf
- http://keys.lucidcentral.org/keys/v3/aquatic_plants/
- EPPO. 2016. Data sheets on pests recommended for regulation/Fiches informatives sur les organismes recommandés pour réglementation: *Myriophyllum heterophyllum* Michaux. *Bulletin OEPP/EPPO Bulletin*, 46(1): 20–24.



Spinycheek crayfish's total body length can grow up to 12 cm long and it is usually found in a wide range of freshwater environments.

© Nobbi B. CC BY-SA 3.0.

Species ID	
Kingdom	Metazoa
Division	Arthropoda
Class	Malacostraca
Order	Decapoda
Family	Cambaridae
Genus	<i>Orconectes</i> ¹
Species	<i>Orconectes limosus</i>
Other designation	Other sources indicate this species as <i>Faxonius limosus</i> (Rafinesque, 1817)

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).

The spinycheek crayfish (*Orconectes limosus*)

Support for customs on the identification of invasive alien species of Union concern

Common names

BG	Американски шипобузест рак
HR	Bodljobrati rak
CZ	Rak pruhovaný
DA	Amerikansk flodkrebs
NL	Gevlekte Amerikaanse rivierkreeft
EN	Spinycheek crayfish
ET	Ogarõskne vähk
FI	Amerikankääpiöraju
FR	Écrevisse américaine
DE	Kamberkrebs
EL	Ποταμοκαραβίδα της Αμερικής
HU	Cifrarák
IE	–
IT	Gambero americano
LV	Dzeloņvaigu vēzis
LT	Rainuotasis vėžys
MT	–
PL	Rak pręgowany
PT	Lagostim-dos-canais
RO	Rac dungat
SK	Rak pruhovaný
SL	Trnavec
ES	Cangrejo de los canales
SV	Taggkindskräfta

1 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/jcbl/rux070>.

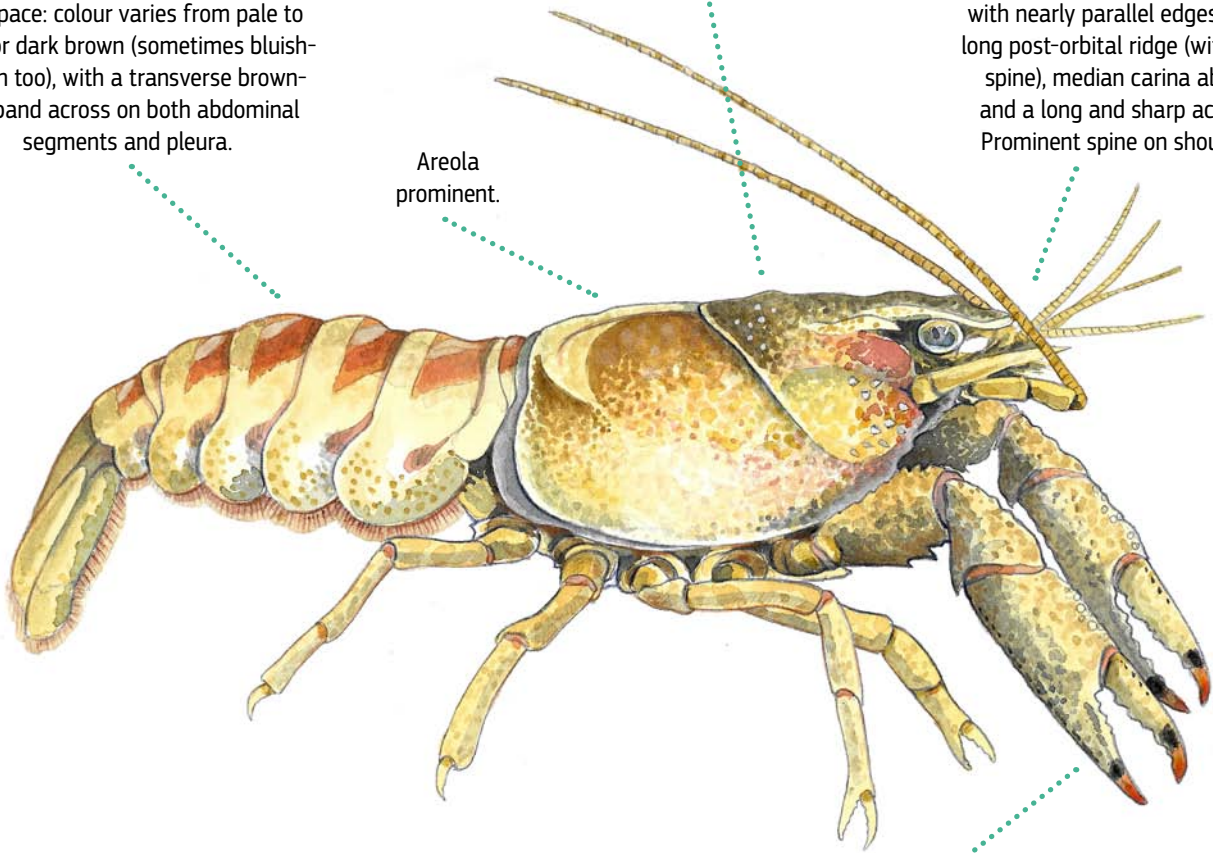
Distinctive characteristics

Carapace: colour varies from pale to olive or dark brown (sometimes bluish-brown too), with a transverse brown-red band across on both abdominal segments and pleura.

Carapace: relatively smooth, with some prominent hepatic spines on sides of anterior carapace (in front of the cervical groove and the cephalic area).

Rostrum: smooth and elongated, with nearly parallel edges, single long post-orbital ridge (with distal spine), median carina absent, and a long and sharp acumen. Prominent spine on shoulders.

Areola prominent.



Chelae: strong and smooth, characterised by regular rows of small light-coloured tubercles along margins of hand and moveable finger, and by the tips coloured in orange followed by a black band. Ventral side with lighter colour. Lost claws can regenerate in a smaller size. Prominent spur on inner side of carpus.

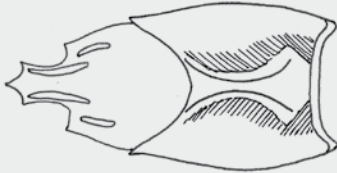
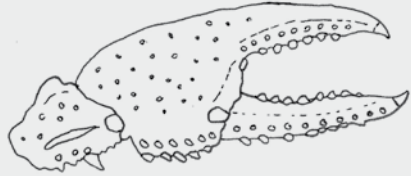
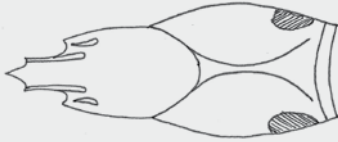
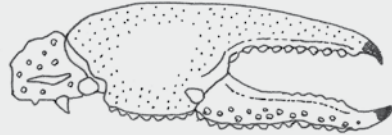
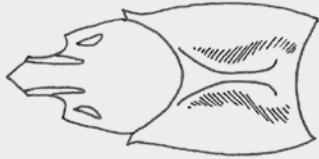

The spinycheek crayfish's carapace has a clear and definitive brown-red band across on both its abdominal segments and pleura. © Archive of Institute Symbiosis.





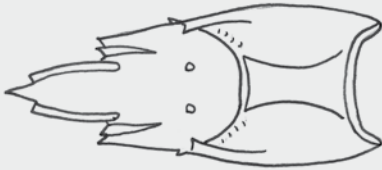

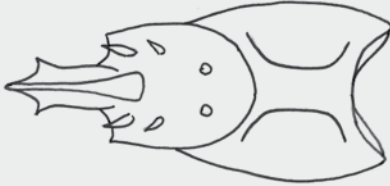

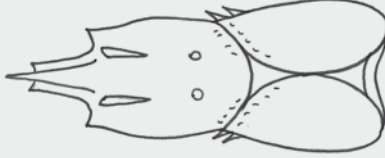

The *Orconectes limosus*'s rostrum is smooth and elongated and has a prominent spine on its shoulders. © Keskkonnavahk. CC BY-SA 4.0.

Similar species

	Carapace	Chelae
<i>Orconectes virilis</i>	 <p>Rostrum without median carina. Parallel margins. Open areola.</p>	 <p>Broad and flat, with straight margin on movable finger. Rows of tubercles. May be blue in colour.</p>
<i>Orconectes rusticus</i> ²	 <p>Rostrum without median carina. Open areola. Dark, rusty spots on either side of its carapace.</p>	 <p>Dark rusty spots. Tubercles not in rows. Oval gap when closed.</p>
<i>Orconectes immunis</i>	 <p>No hepatic spines on lateral margins of carapace. Typical pale bands running along dorsal surface of abdomen.</p>	 <p>Broad, flattened tuberculate chela, with straight margin of movable finger.</p>

² 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.

Other species alien to Europe

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

The *Orconectes rusticus*, which has dark rusty spots on its chelae, can be confused with the *Orconectes limosus*. © Cgoldsmith1. CC BY-SA 3.0.



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.



The spinycheek crayfish is able to live in temporary and polluted habitats as the species can tolerate these pretty well. © Maciej Bonk.



Fountain grass is a perennial culms forming grass with erect to arching culms growing over one metre in height. © JM Dufour-Dror (location of image: USA, Hawai'i, Big Island).

Species ID	
Kingdom	Plantae
Division	Tracheophyta
Class	Spermatopsida
Order	Poales
Family	Poaceae
Genus	<i>Pennisetum</i>
Species	<i>Pennisetum setaceum</i>

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.

The fountain grass (*Pennisetum setaceum*)

Support for customs on the identification of invasive alien species of Union concern

Common names

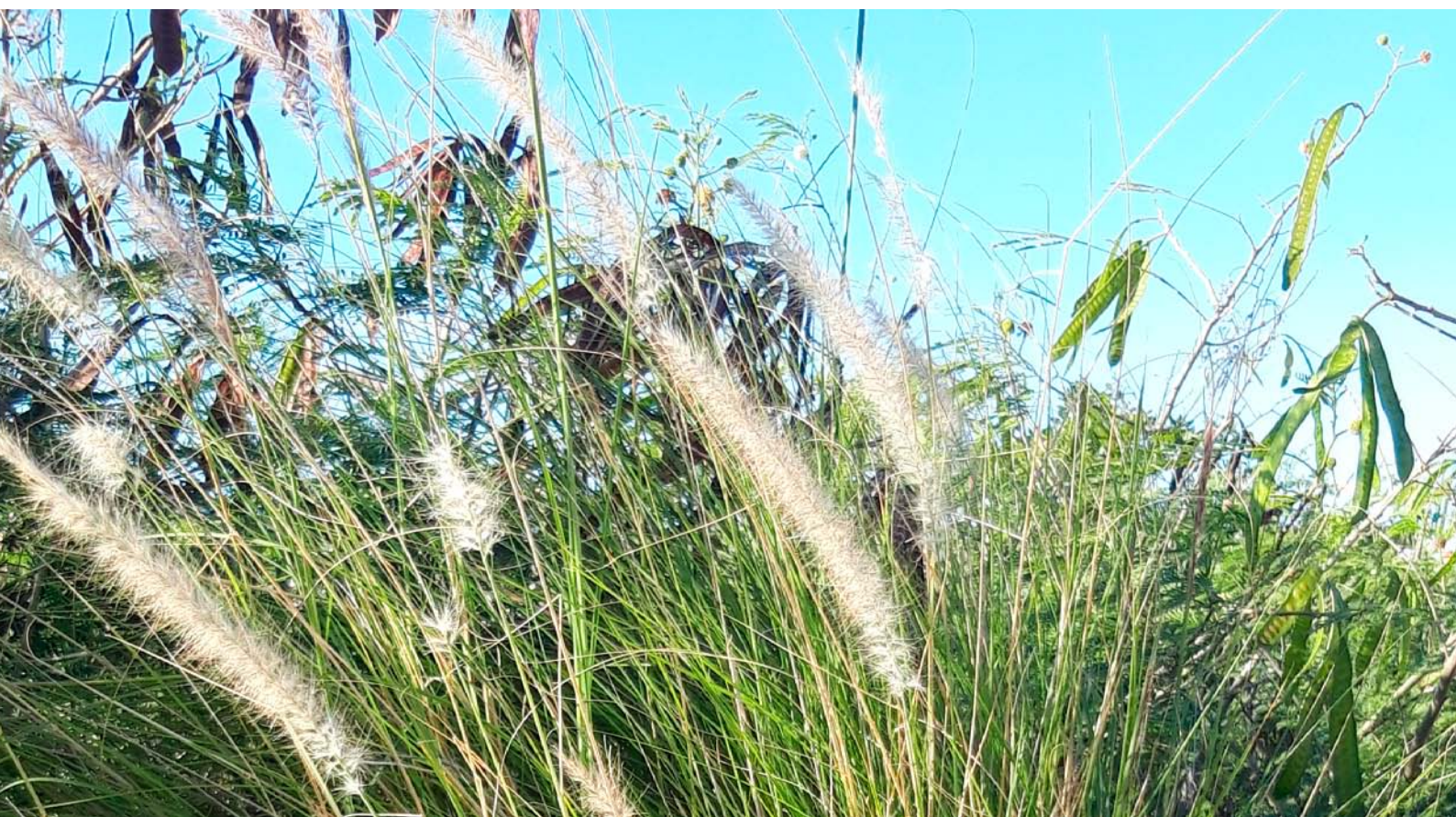
BG	фонтан трева
HR	Čekinjasta trava
CZ	Dochan setý
DA	Lampepudsergræs
NL	Fraai lampenpoetsgergras
EN	Fountain grass
ET	Harjas hiidhirss
FI	Arabiansulkahirssi
FR	Herbe aux écouvillons rouge
DE	Afrikanisches Lampenputzergras
EL	ΠΕΝΙΣΕΤΟ
HU	Rózsás tollborzfü
IE	–
IT	Penniseto allungato
LV	Purpurvioletā sarzāle
LT	Šeriuotoji soruolė
MT	Il-pennizetum
PL	Rozplenica szczecinkowata
PT	Penisetum
RO	No common name, unofficially known as 'Rubrum'
SK	Perovec veľkokvetý
SL	Rdečelistna ščetinasta perjanka
ES	Plumero
SV	Fjäderborstgräs

Distinctive characteristics

Densely clumped appearance, tufted, forming like a fountain from the base



The stems from the fountain grass plant can grow between 20 and 130 cm high. © Tim Adriaens, INBO. CC BY-NC.



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.



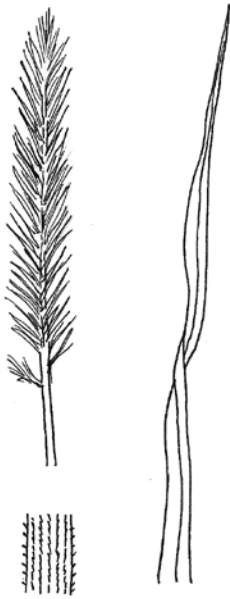
Spikelet: about 6 mm long, with prominent bristles, in clusters of 1–3. Stipe relatively long, over 1.1 mm



Pennisetum setaceum has densely clumped appearance tufted grass forming like a fountain from the base. © Tim Adriaens, INBO. CC BY-NC.

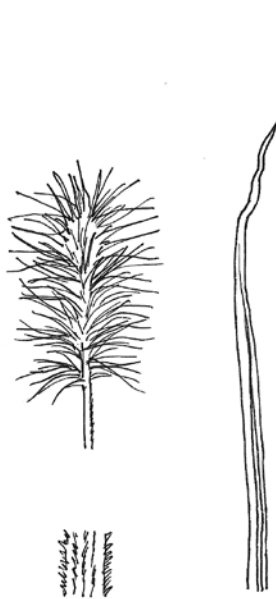
Similar species

Pennisetum advena



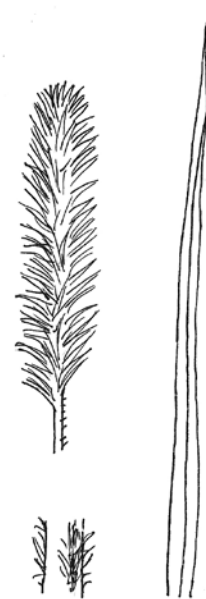
Differs from *P. setaceum* in the leaf blade being flatter, wider, and shorter (23–52 cm X 0.6–1.1 cm; see image below); peduncle rough to the touch below the panicle.

Pennisetum villosum

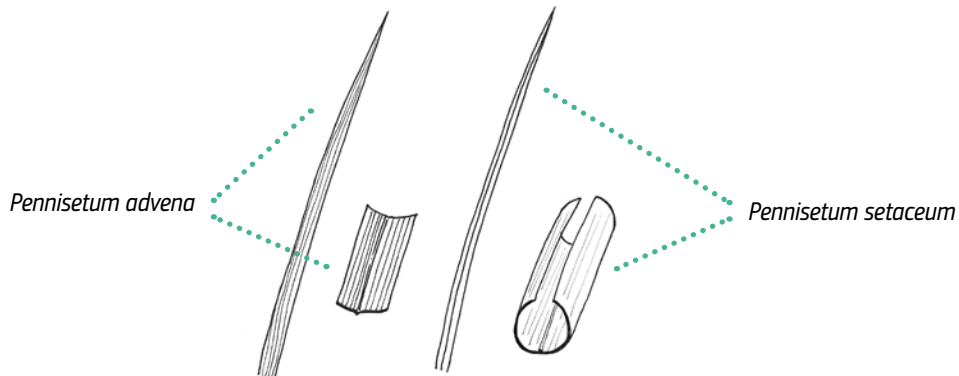


Differs in smaller dimensions of the plant, peduncle hairy below the panicle, spikelets single with bristles up to 50 mm. Inflorescence with a very different appearance.

Pennisetum alopecuroides



Differs in smaller dimensions of the plant, peduncle hairy below the panicle, bristles unequal as opposed to some bristles being distinctly longer than others in *P. setaceum*.



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).

Remark: 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/>.

Depending on water availability and season, the leaves of *Pennisetum setaceum* can turn green or brown. © JM Dufour-Dror (location of image: USA, Hawai'i, Big Island).

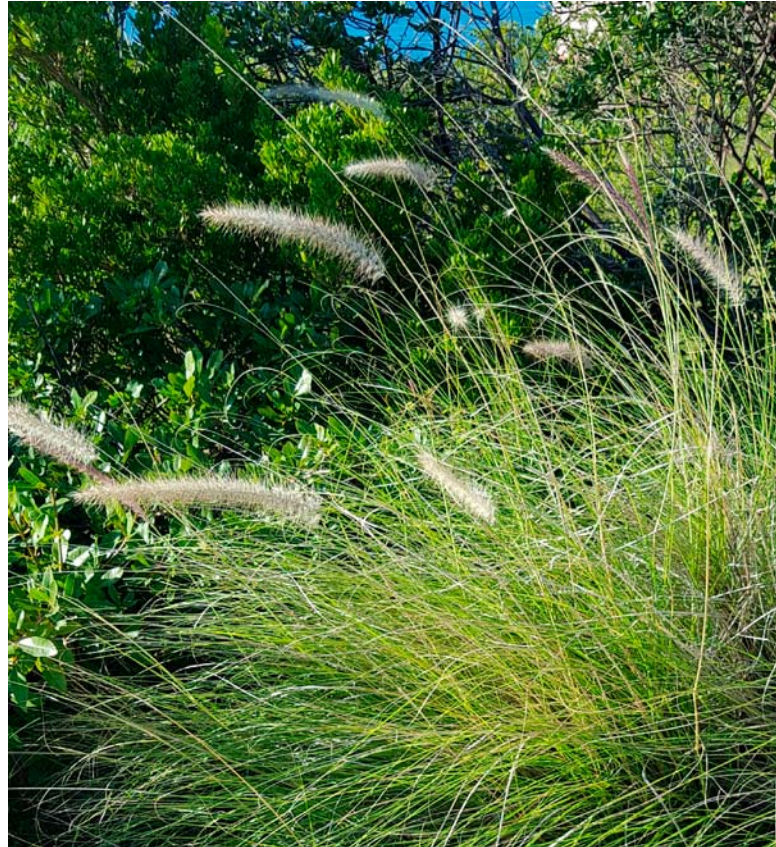


Key references

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.

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

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.



The fruits of the fountain grass are small, dry achenes adorned with long showy bristles. © Wolfgang Rabitsch.



Marbled crayfish reproduce by parthenogenesis: development of embryos occur without fertilisation by sperm. © Archive of Institute Symbiosis.

Species ID	
Kingdom	Metazoa
Division	Arthropoda
Class	Malacostraca
Order	Decapoda
Family	Cambaridae
Genus	<i>Procambarus</i>
Species	<i>Procambarus fallax</i> f. <i>virginalis</i>
Other designation	Other sources indicate this species as <i>Procambarus virginalis</i> (Lyko, 2017)

General description

The marble pattern, from which the common name Marmorkrebs is derived (German for “marbled crayfish”), is always present and especially prominent on the lateral parts of the carapace. The marble pattern is highly variable, usually dark brown to olive, but can vary from tan to reddish brown or blue. Chelipeds (claws) are relatively small, two times shorter than the carapace length.

Size

Up to 13 cm, but often less than 10 cm.

The marbled crayfish (*Procambarus fallax* f. *virginalis*)

Support for customs on the identification of invasive alien species of Union concern

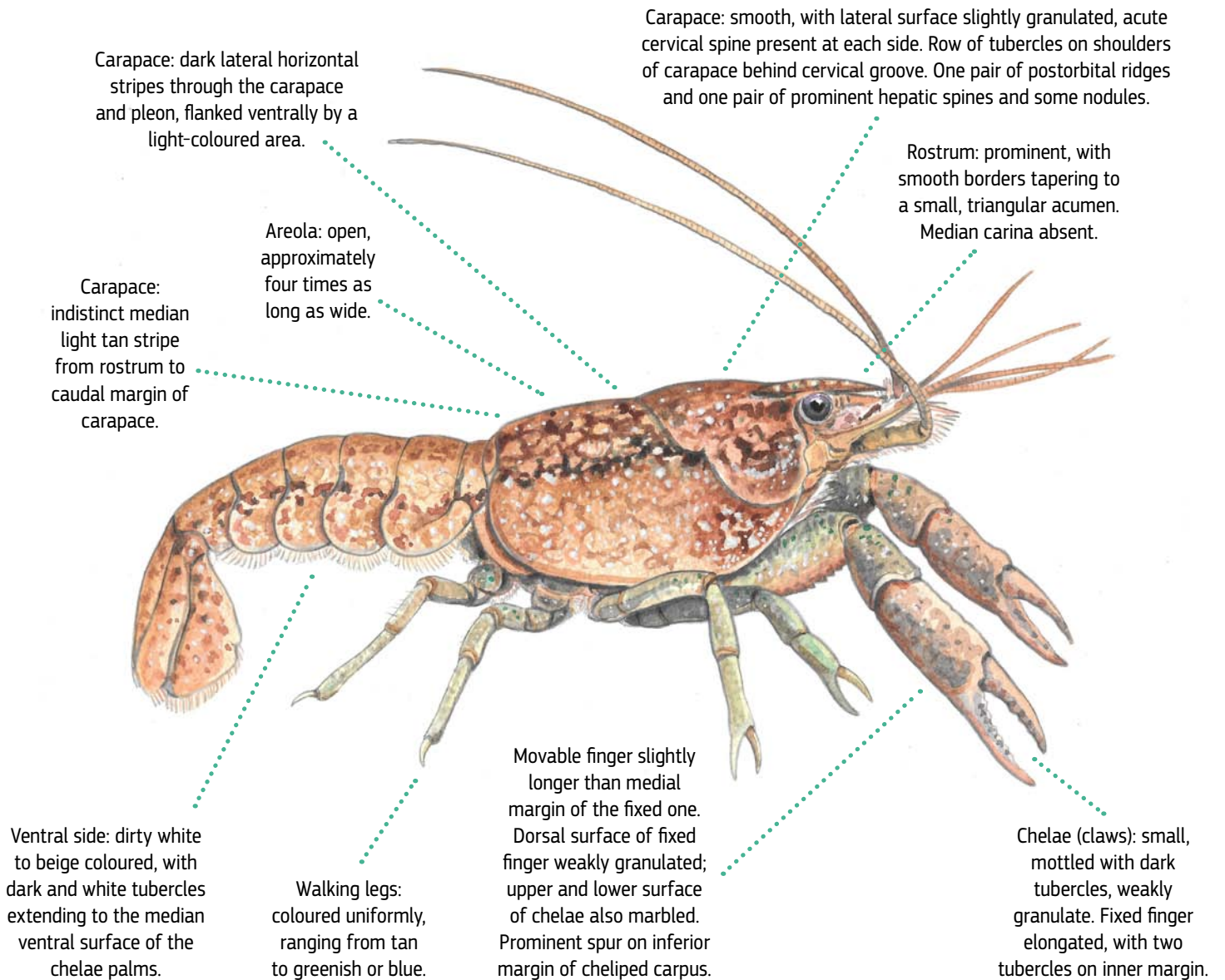
Common names

BG	Американски мраморен рак
HR	Mramorni rak
CZ	Rak mramorovaný
DA	Marmorkrebs
NL	Marmerkreeft
EN	Marbled crayfish
ET	Marmorvähk
FI	Marmorirapu
FR	Écrevisse marbrée
DE	Marmorkrebs
EL	–
HU	Virginiai márványrák
IE	–
IT	Gambero marmorato
LV	Marmorvēzis
LT	Marmurinis vėžys
MT	Iċ-ċkala tal-ilma ħelu
PL	Rak marmukowy
PT	Lagostim-mármore
RO	Rac marmorat
SK	Rak mramorový
SL	Marmornati škarjar
ES	Cangrejo de mármol
SV	Marmorkräfta

Disclaimer:

The taxonomic identity of this species is uncertain. As shown by molecular techniques and morphological studies, it seems to be the parthenogenetic form of *Procambarus fallax* (all marbled crayfish known so far are female and all specimens in Europe are clones). Individuals confirmed as marmorkrebs by molecular techniques, but with rather different body patterns and a totally different rostrum shape, are known. Species identification of juveniles is even more difficult for non-experts because the distinctive characteristics are not always well developed. It can require the use of microscope. Just in case, it is recommended to contact an expert.

Distinctive characteristics



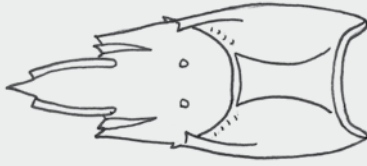

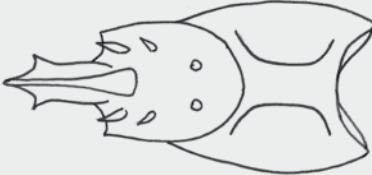

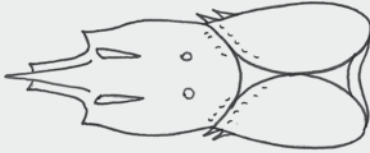

All individuals are female, and the offspring are genetically identical to the parent. © Aleksander Niweliński.



Similar species

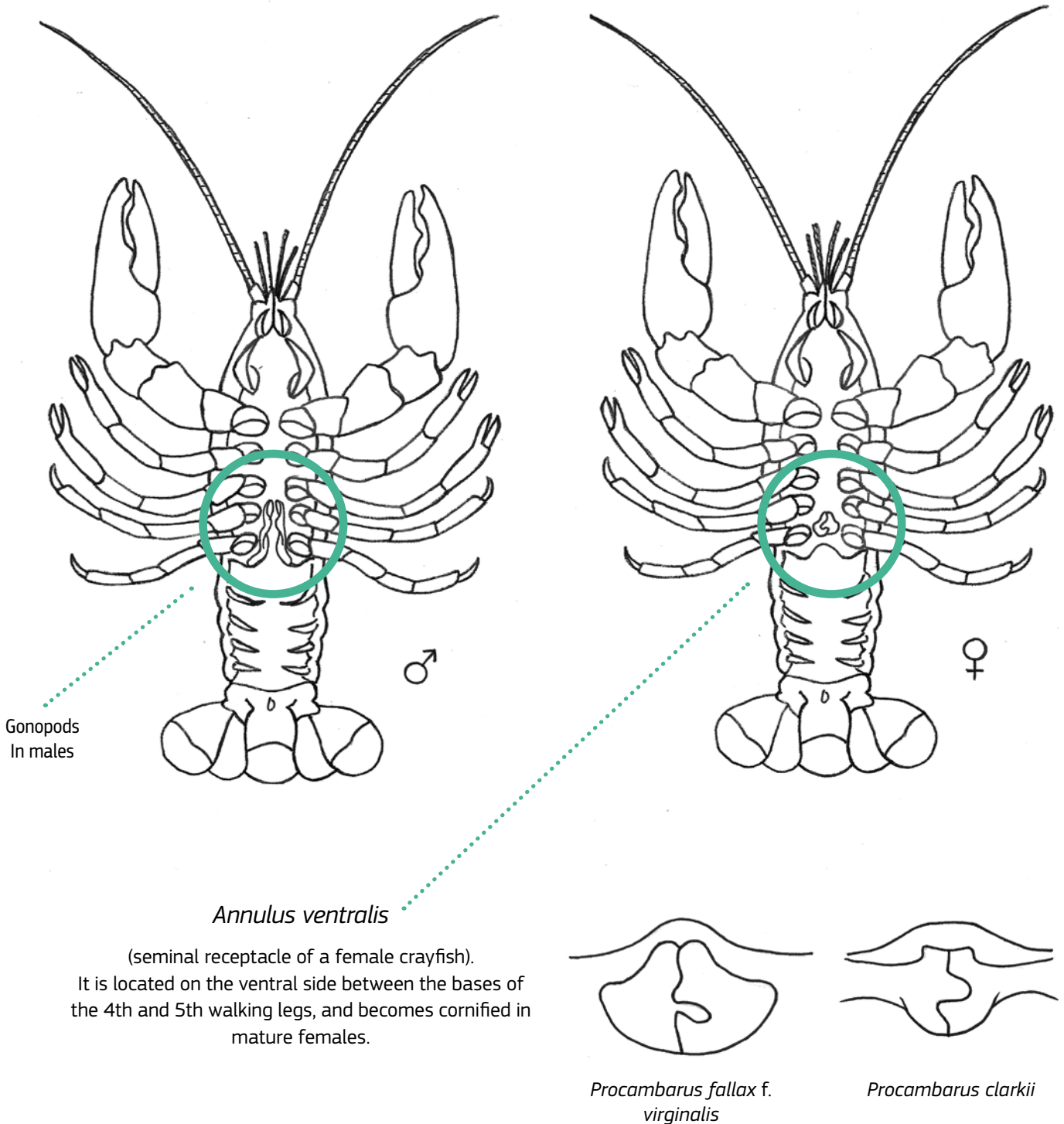
About 460 species of cambarids are known, of which around 179 species belonging to the genus *Procambarus*, although not all are found in trade. A high degree of overlap exists between species. Additionally, *Procambarus fallax* f. *virginalis* is characterised by a high intraspecific variability, e.g. concerning coloration, growth, life-span, reproduction, behaviour and number of sense organs, due to non-genetic

or environmentally induced changes during ontogenesis. For example differences concern the marbled pattern, the rostrum shape, and the presence of several spines at the margin of the rostrum. In particular, the rostrum variations led to uncertainties because shape and other features of this body part are important characters for species identification within cambarids (Martin *et al.* 2010).

	Carapace	Chelae
<i>Procambarus fallax</i> f. <i>virginalis</i>	 <p>Open areola.</p>	 <p>Very small, weakly granulate.</p>
<i>Pacifastacus leniusculus</i>	 <p>Rostrum with median carina. Large areola.</p>	 <p>Robust and smooth, with white turquoise patch on top of junction of fingers.</p>
<i>Procambarus clarkii</i>	 <p>No areola.</p>	 <p>S-shaped, covered with small bumps.</p>
<i>Procambarus fallax</i>	<i>Procambarus acutus</i> and <i>Procambarus zonangulus</i>	<i>Procambarus alleni</i>
Very similar to <i>Procambarus fallax</i> f. <i>virginalis</i> . Marble pattern less evident.	Very similar to <i>P. clarkii</i> , their taxonomy is still debated, possibly may belong to a species complex. Carapace covered in tubercles producing a rough texture. Open areola. Chelae long and slender.	Very similar to <i>P. clarkii</i> , but usually bluish tinged to brightly blue coloured (which may occur also to marmorkreb in water with low pH). Marble pattern less evident. Characteristic facial dark spots. Chelae: marble pattern less evident, not as slender, thicker.

Procambarus fallax f. virginalis is a species that reproduces parthenogenetically, and only females are known¹. Therefore, a way to exclude that the crayfish to be identified belongs

to *Procambarus fallax f. virginalis* is to check the presence of gonopods², which occur only in male crayfish (left).



- 1 With the notable exception of an intersexual specimen (with both *Annulus ventralis* and only one pair of gonopods) found in 2010 in a lab (Martin & Scholtz 2012).
- 2 The gonopods are the first two pairs of pleopods (also known as swimmerets) on the crayfish's abdomen. The gonopods have been specially modified for reproductive purposes. The gonopods are held against the body of the crayfish between the last two pair of walking legs.

Key references

- CABI (2017). *Procambarus fallax f. virginalis* (Marmorkrebs) [original text by Christoph Chucholl]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <https://www.cabi.org/isc/datasheet/110477> (Access Date: 01/11/2017)
- Holdich, D. (2011). GB Non-native Organism Risk Assessment for *Procambarus* sp. www.nonnativespecies.org (Access Date: 01/11/2017)
- Martin, P. and Scholtz, G. (2012). A case of intersexuality in the parthenogenetic Marmorkrebs (Decapoda: Astacida: Cambaridae). *Journal of Crustacean Biology* 32: 345–350.
- Martin, P., Shen, H., Füllner, G. and Scholtz, G. (2010). The first record of the parthenogenetic Marmorkrebs (Decapoda, Astacida, Cambaridae) in the wild in Saxony (Germany) raises the question of its actual threat to European freshwater ecosystems. *Aquatic Invasions* 5:397–403.
- Pöckl, M., Holdich, D.M. and Pennerstorfer, J. (2006). Identifying native and alien crayfish species in Europe. European Project CRAYNET.
- Souty-Grosset, C., Holdich, D.M., Noël, P.Y., Reynolds, J.D. and Haffner, P. (eds) (2006). *Atlas of Crayfish in Europe*. Muséum National d'Histoire Naturelle, Paris. Patrimoines naturels, 64.



A single individual is needed to establish a new population, and they can reproduce at high rates. © André Karwath aka Aka. CC BY-SA 2.5.



The grey squirrel is a medium-sized tree squirrel with dark to pale greyish aguti fur and their tail is often held over the back.

© PierreSalim. CC BY 3.0.

Species ID	
Kingdom	Metazoa
Division	Chordata
Class	Mammalia
Order	Rodentia
Family	Sciuridae
Genus	<i>Sciurus</i>
Species	<i>Sciurus carolinensis</i>

General description

Medium-sized tree squirrel with dark to pale greyish aguti fur, at times tawny colour, in particular on the hips, feet, head and sometimes on the back (i.e. especially in summer), with white to grey underparts (but melanistic 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

The grey squirrel (*Sciurus carolinensis*)

Support for customs on the identification of invasive alien species of Union concern

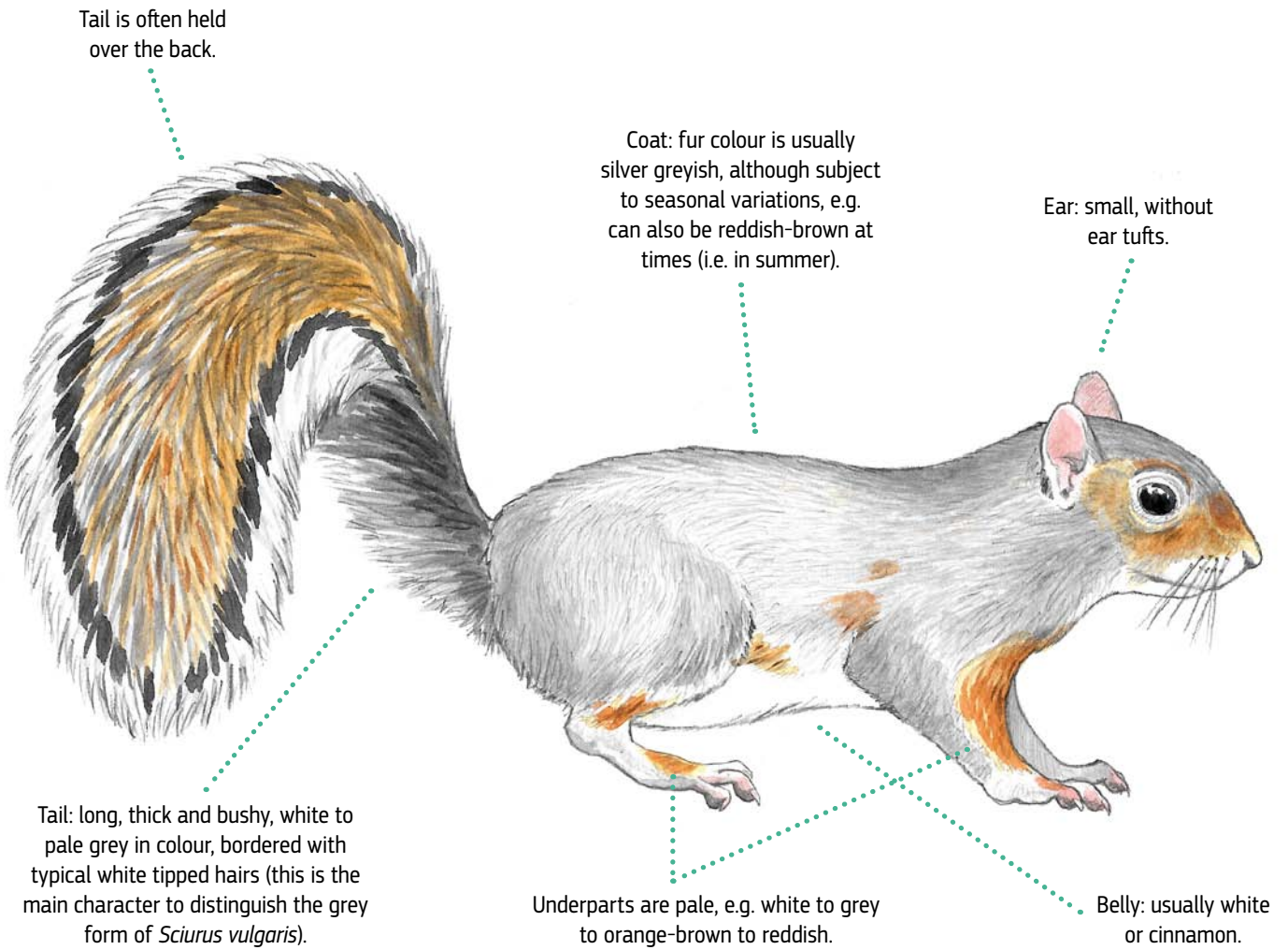
Common names

BG	Източна сива катерица
HR	Siva vjeverica
CZ	Veverka popelavá
DA	Gråt egern
NL	Grijze eekhoorn
EN	Grey squirrel
ET	Hallorav
FI	Harmaaorava
FR	Écureuil gris
DE	Grauhörnchen
EL	Γκριζος σκίουρος
HU	Szürke mókus
IE	Iora glas
IT	Sciattolo grigio
LV	Pelēkā vāvere
LT	Pilkoji voverė
MT	–
PL	Wiewiórka szara
PT	Esquilo-cinzento
RO	Veveriță cenușie
SK	Veverica sivá
SL	Siva veverica
ES	Ardilla de las Carolinas
SV	Gråekorre

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



The grey squirrel has small distinctive ears without ear tufts. © Charles J Sharp. CC BY-SA 4.0.



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.


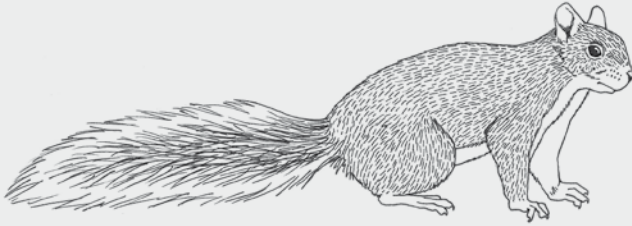


- *Sciurus griseus* (western grey squirrel) which is 50% larger, primarily silver grey with little if any brown visible in the pelage and large ears.
- *Sciurus arizonensis* (Arizona grey squirrel) which is also 50% larger but difficult for most to distinguish. This is a very uncommon species from small 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

and Mexico and invasive in islands off 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 sizes 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.

Size		Colour
<i>Callosciurus caniceps</i>		
<ul style="list-style-type: none"> • Head-body 21–23 cm, tail 22–24 cm. • Weight 260–320 g. 		<p>The belly is usually grey, sometimes reddish. Tail often with a black tip. Upperparts olive-brown to reddish.</p>
<i>Callosciurus pygerythrus</i>		
<ul style="list-style-type: none"> • Head-body 18–21 cm, tail 15–18 cm. • Weight about 250 g. 		<p>Dark olive brown dorsally. Ventral pelage from bluish grey to cream and orange.</p>

Size		Colour
<i>Callosciurus erythraeus</i>		
<ul style="list-style-type: none"> • Head-body 20–26 cm, tail 16–20 cm. • Weight: 210–435 g. 		<p>Back fur colour olive green to brown, usually presenting a yellowish or orange-red belly, and a lightly striped tail with the tip being sometimes slightly grey-whitish. Geographical variation is considerable with different colour forms.</p>
<i>Sciurus griseus</i>		
<ul style="list-style-type: none"> • Head-body 27–32 cm, tail 24–31 cm. • Weight 520–950 g 		<p>Slate to silver grey dorsum and a white venter, with white to buff eye ring. Tail long and bushy with a silver grey colour, sometimes darker at the core and a frosting of white to silver. Ears are silver grey, quite prominent without tufts (proportionally, they are large when compared to other squirrel species).</p>
<i>Sciurus niger (vulpinus)</i>		
<ul style="list-style-type: none"> • Head-body 26–37 cm, tail 20–33 cm. • Weight 507–1361 g 		<p>Pelage of variable colour, but subspecies <i>S. n. vulpinus</i> greyish washed with orange-reddish on dorsum, sides, limbs and underside of the tail; venter white to cream. Upperside of tail is darker.</p>
<i>Sciurus vulgaris</i>		
<ul style="list-style-type: none"> • Head-body 21–25 cm, tail 15–21 cm. • Weight 235–480 g 		<p>Pelage variable from red to brown, grey or black in dorsum, sides and limbs, while venter is white to cream. Tail is often the same colour of the dorsum, often darker, or lighter in some subspecies (but white tipped hairs, typical of <i>S. carolinensis</i>, are never present in tail). Ear tufts are pronounced in winter and reduced, or even absent, in summer. Melanism is common.</p> <p>In southern Italy, the Calabrian black squirrel – now recognised as a separate species, <i>Sciurus meridionalis</i> – is completely black with white venter.</p>

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.



The tail of a grey squirrel is long, thick and bushy and white to pale grey in colour, bordered with typical white tipped hairs. This distinctive feature is the main character to distinguish the grey form of *Sciurus vulgaris*. © Wolfgang Rabitsch.



The Siberian chipmunk lives in loose colonies, where every individual has its own territory. © Aleksander Niweliński.

Species ID	
Kingdom	Metazoa
Division	Chordata
Class	Mammalia
Order	Rodentia
Family	Sciuridae
Genus	<i>Tamias</i>
Species	<i>Tamias sibiricus</i>
Other designation	Other sources indicate this species as <i>Eutamias sibiricus</i> (Laxmann, 1769)

General description

Small striped squirrel with brightly coloured fur, brown-grey to ochre yellow on the back. It is characterised by four light and five dark longitudinal stripes along its sides, and a light brown tail with broad black lines on both sides, and narrow white edges. Dorsal stripes are all sub-equally spaced; the lateral pair of dark stripes is shorter than the median trio, which reach the shoulders and rump. It does not show sexual dimorphism, and the colouration does not vary during the year, although it displays geographic variation.

Size

Total length 18–25 cm, of which 40–50% is represented by the tail. Weight: 80–100 g.

The Siberian chipmunk (*Tamias sibiricus*)

Support for customs on the identification of invasive alien species of Union concern

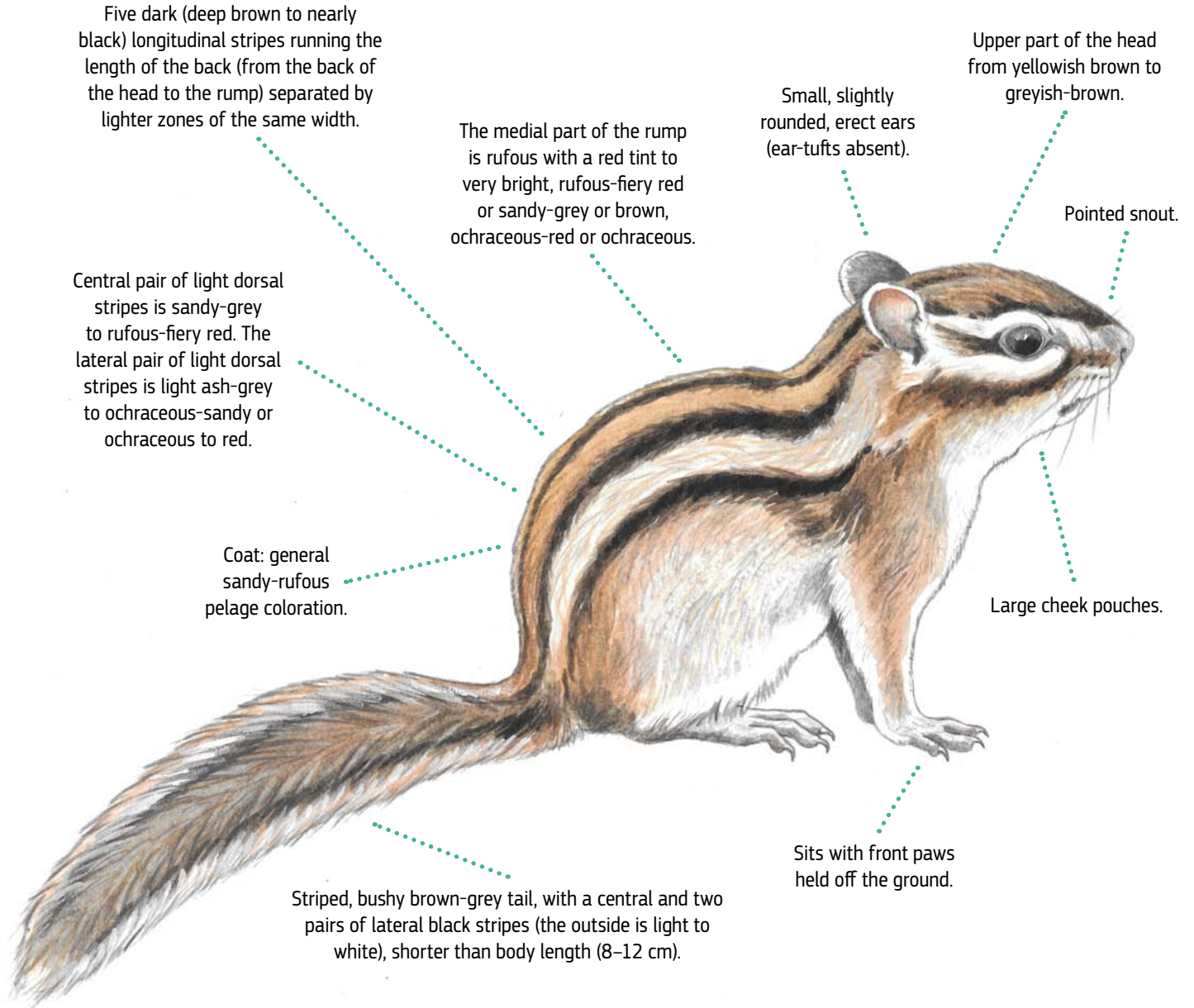
Common names

BG	Азиатски (сибирски) бурундук
HR	Sibirska vjeverica
CZ	Burunduk páskovaný
DA	Sibirisk jordegern
NL	Siberische grondeekhoorn
EN	Siberian chipmunk
ET	Siberi vöötörav (burundukk)
FI	Siperianmaaorava
FR	Tamia de Sibérie
DE	Sibirisches Streifenhörnchen
EL	–
HU	Szibériai csíkosmókus (burunduk)
IE	Iora talún sibéarach
IT	Tamia siberiano
LV	Sibīrijas burunduks
LT	Sibirinis burundukas
MT	–
PL	Burunduk
PT	Esquilo-da-Sibéria
RO	Veveriță siberiană
SK	Burunduk pruhovaný
SL	Sibirski burunduk
ES	Ardilla de Siberia
SV	Sibirisk jordekorre

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



Tamias sibiricus is able to survive in various environmental conditions, anywhere from 29°N to 69°N and -65 °C to 30 °C. © Frank Vassen. CC BY 2.0





The Siberian chipmunk has two black lateral stripes on either side of a white or whitish yellow band. © Alpsdake. CC BY-SA 3.0.

Similar species

There are several squirrel species with a striped back. While some of them can be easily distinguished from a few key features (e.g. in relation to the patterns of the stripes, the size, or other morphological aspects), other species, particularly

those belonging to the same genus, are particularly difficult to identify and may ultimately require genetic testing for correct identification at the species level.

Tamias striatus

The Siberian chipmunk, *Tamias sibiricus*, closely resembles the eastern chipmunk, *Tamias striatus*, a species native to North America.

Size: Total length: 22–27 cm.

Weight 80–125 g.

Innermost paired dorsal stripes: about twice the width of other stripes in *T. striatus*, about equal in width to the remaining stripes in other *Tamias* sp.

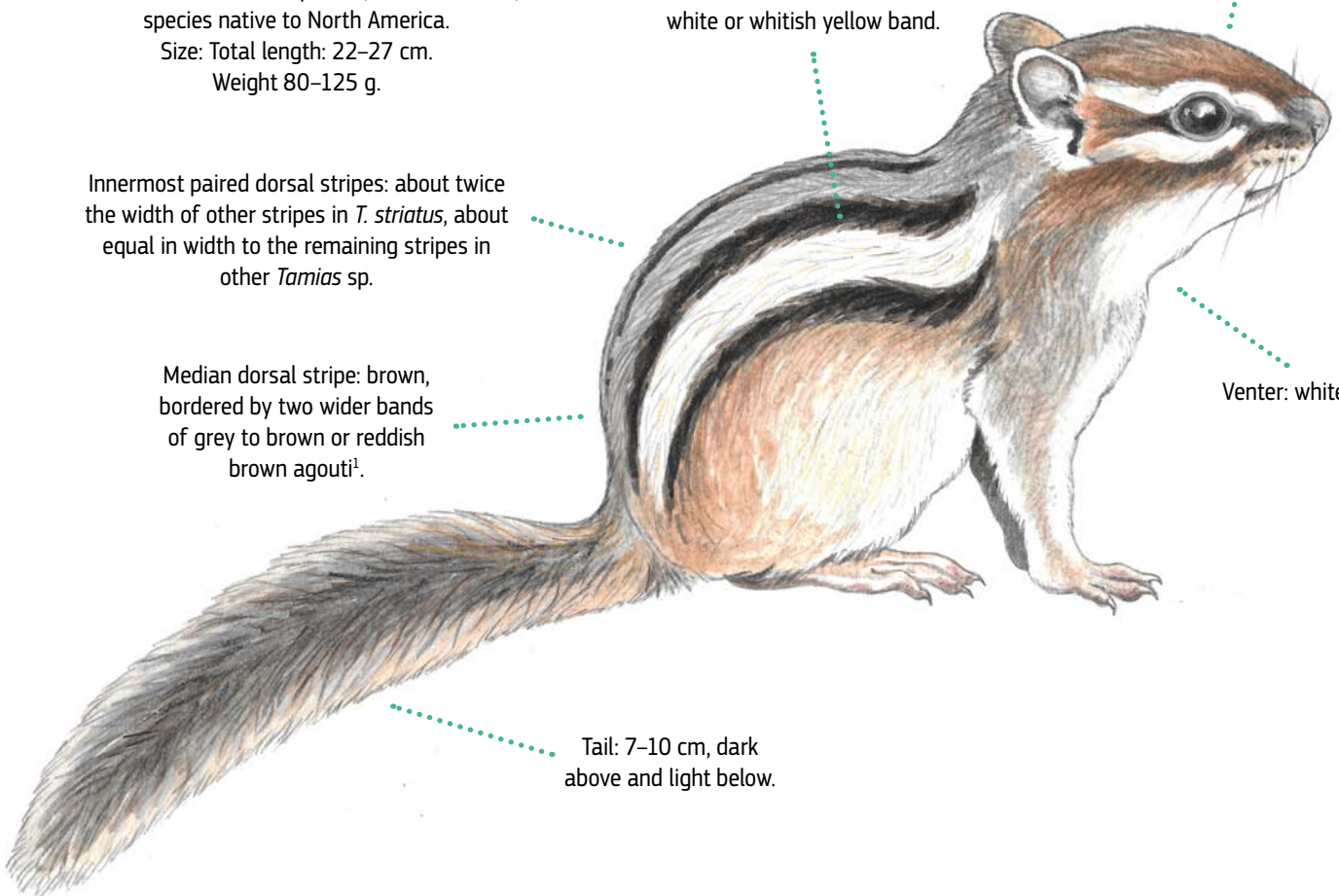
Median dorsal stripe: brown, bordered by two wider bands of grey to brown or reddish brown agouti¹.

Lateral stripes: two black bands on either side of a white or whitish yellow band.

Two darker stripes extend from the ears to the nose.

Venter: white.

Tail: 7–10 cm, dark above and light below.







¹ Agouti: greyish colour with a brindled appearance.

NB: In pet shops in France, the Siberian chipmunk is often called *Tamias striatus*, which is an important source of confusion, even in some publications.

for a selection of the most representative species which may be found in trade, and which are considered similar to *Tamias sibiricus*. NB: weight and dimension are indicative only, as they generally refer to a sample of animals and do not cover the complete possible range.

Below, some diagnostic features are reported / illustrated

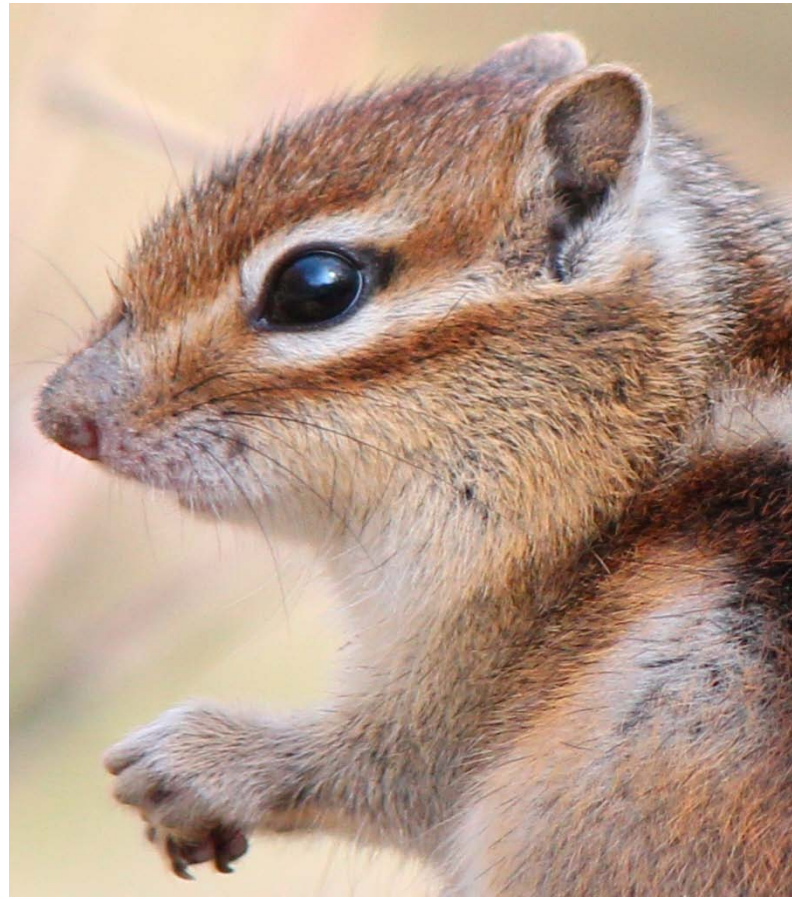
Size		Colour	Stripes
<i>Funambulus pennantii</i>			
<ul style="list-style-type: none"> • Total length: 23 to 36 cm; tail about 50% of total body length. • Weight 95–103 g 		The top coat colour ranges from greyish brown to almost black, while the head is usually greyish to reddish brown.	There are typically three lightly coloured stripes on the back.
<i>Menetes berdmorei</i>			
<ul style="list-style-type: none"> • Head-body: 18–20 cm, tail 13–14 cm. • Weight 170–190 g 		Dorsal agouti with two whitish lateral lines in each side and variable number of dark or black lines; venter whitish or yellowish.	The dark or black lines range from none to three lateral and a mid-dorsal line.
<i>Tamiops mclellandii</i>			
<ul style="list-style-type: none"> • Head-body: 10–11 cm, tail 102–110 cm. • Weight 39–52 g 		The back is brown-grey, with three dark-black strips alternate with light bands. The venter is ochraceous. Ear tufts are common, often white.	Three dark-black strips alternate with light bands
<i>Callospermophilus lateralis</i>			
<ul style="list-style-type: none"> • Total length: 23–30 mm (of which 8–9 cm of tail). • Weight 120–400 g 		It has a golden-red mantle that extends from the head down over their shoulders. The back is grey, brownish or buff, and their undersides are whitish or yellowish-grey. The tail is brownish-black above, and reddish brown on the underside. The species is sexually dimorphic, with males having a brighter red mantle.	One white stripe, bordered by two black stripes, extends horizontally down the body, similar to <i>Tamias</i> . It has a whitish fur eye ring and no facial striping unlike <i>Tamias</i> . Compared to <i>Tamias</i> it does not have a median black line.

Key references

CABI (2017). *Tamias sibiricus* (Siberian chipmunk) [original text by Jean-Louis Chapuis, Ekaterina Obolenskaya, Benoit Pisanu, Andrey Lissovsky]. In: Invasive Species Compendium. Wallingford, UK: CAB International. <https://www.cabi.org/isc/datasheet/62788>(Access Date: 01/11/2017)

GB Non-native Species Secretariat (Sarah Downing, Vicky Ames, Max Wade and Kelly McKee of RPS). Siberian Chipmunk. <http://www.nonnativespecies.org/downloadDocument.cfm?id=76>(Access Date: 01/11/2017)

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.



Tamias sibiricus, Siberian chipmunk. © Alpsdake. CC BY-SA 3.0.

