

Identification guide of Invasive Alien Species of Union concern

Support for customs on the identification of IAS of Union concern

Project task ENV.D.2/SER/2016/0011 (v1.1)

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

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Gunnera tinctoria

Giant rhubarb, Chilean rhubarb, Chilean gunnera, Nalca, Panque

Synonyms

Gunnera chilensis Lam., *Gunnera scabra* Ruiz. & Pav., *Panke tinctoria* Molina.

Species ID

Kingdom: Plantae

Division: Magnoliophyta

Class: Angiosperm

Order: Gunnerales

Family: Gunneraceae

Genus: *Gunnera*

Species: *Gunnera tinctoria*

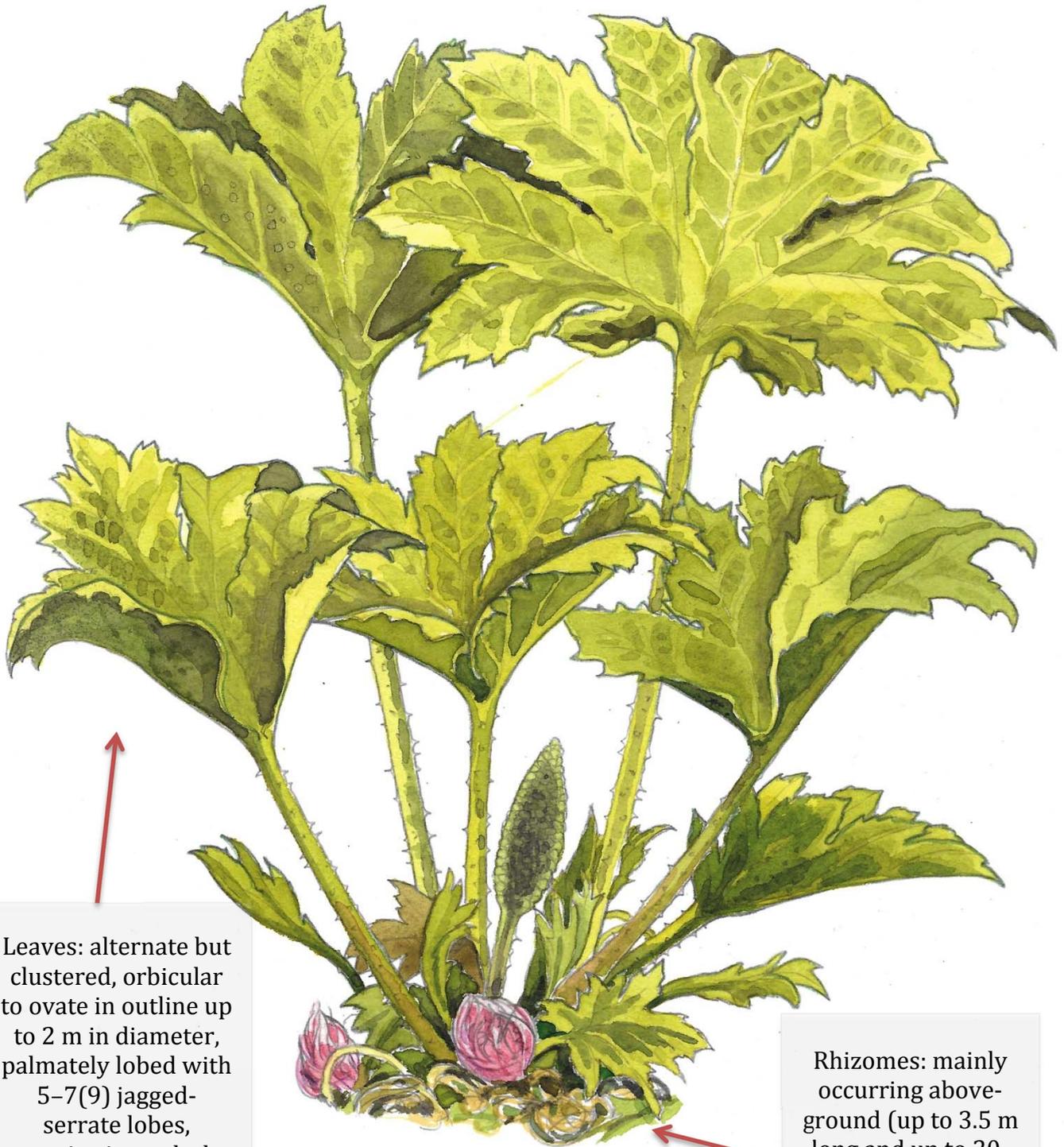
General description:

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

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).

Disclaimer:

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

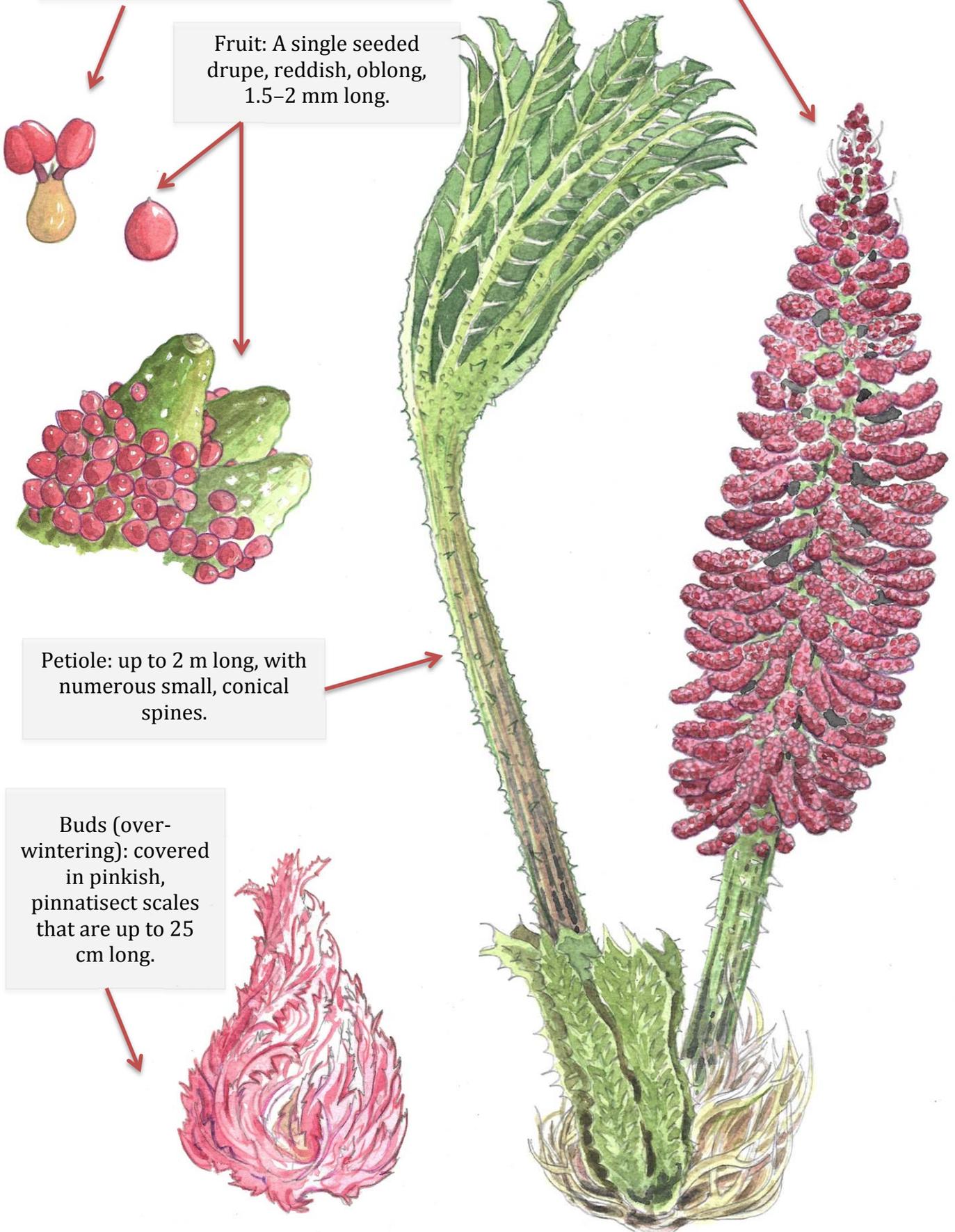
Flowers: tiny green female or hermaphrodite densely packed on the inflorescence branches, sessile, apetalous, with minute sepals, about 1 mm long.

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

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

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

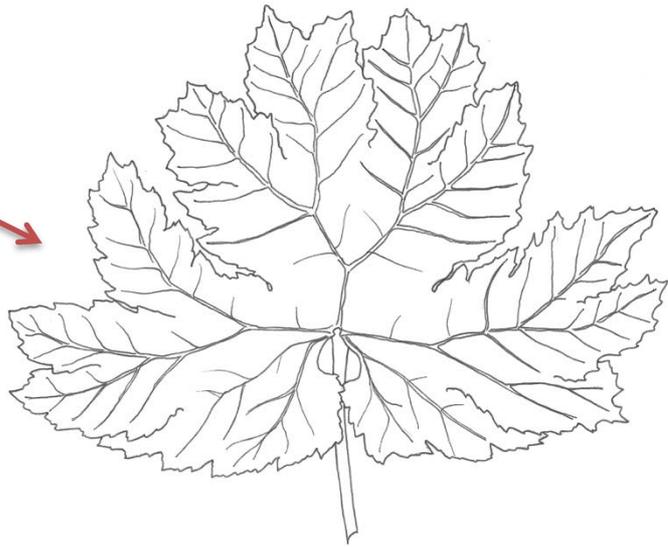
Buds (overwintering): covered in pinkish, pinnatisect scales that are up to 25 cm long.



Similar species

Chilean gunnera
Gunnera tinctoria

Leaf: Palmately lobed, less than 2m across.



Giant Rhubarb
Gunnera manicata

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



Ornamental Rhubarb
Rheum palmatum

Leaf: Palmately lobed, up to 1 m across.



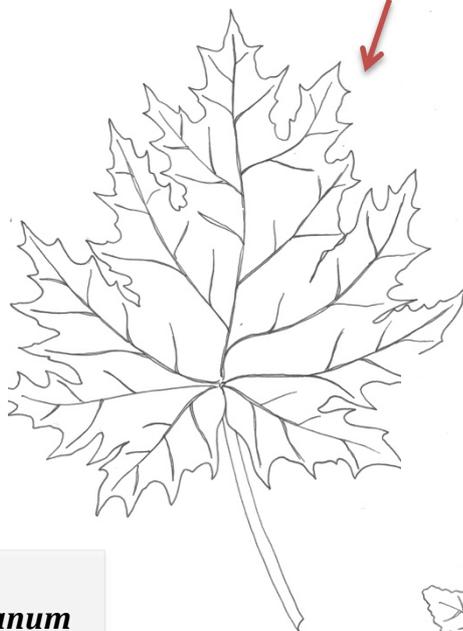
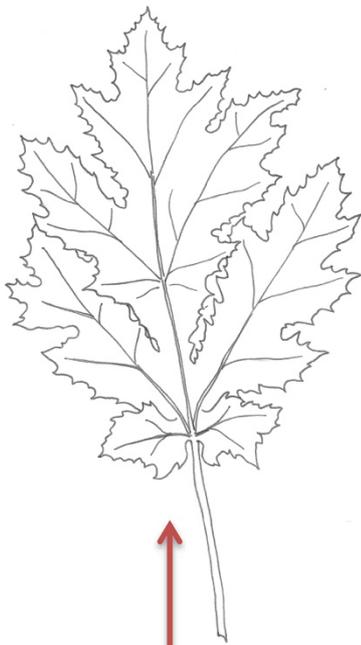
Cultivated Rhubarb
Rheum x hybridum

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



Giant Hogweed
Heracleum mantegazzianum

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



Giant Rhubarb
Gunnera manicata

Key features compared to *G. 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 *G. 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

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 specimen are very large (over 1,5 m in diameter), slightly hairy below and deeply incised, with short rounded teeth in the margin.

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.

Common names

BG	-
HR	Čileanska rabarbara
CS	batora chilská
DA	Farvegunnera
NL	Gewone gunnera
EN	Chilean gunnera (Chilean rhubarb)
ET	tšiili gunnera
FI	värigunnera
FR	Rhubarbe géante du Chili
DE	Mammutblatt (Riesenhaharber)
EL	-
HU	chilei óriáslapu (chilei óriásrebarbara)

GA	Gunnaire
IT	Rabarbaro cileno
LV	krāsu gunnera
LT	čilinė gunera
MT	-
PL	Gunnera brazylijska
PT	gigante
RO	-
SK	gunera farbiarska
SL	čilenska gunera
ES	Nalca
SV	röd jättegunnera

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)

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

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)

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.

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

Alternanthera philoxeroides

Alligator weed, pig weed

Synonyms

Achyranthes philoxeroides (Mart.) Standl.;
Achyranthes paludosa Bunbury; *Alternanthera philoxerina* Suess.; *Bucholzia philoxeroides* Mart.;
Telanthera philoxeroides (Mart.) Moq.

Species ID

Kingdom: Plantae
Division: Magnoliophyta
Class: Dicotyledoneae
Order: Caryophyllales
Family: Amaranthaceae
Genus: *Alternanthera*
Species: *Alternanthera philoxeroides*

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.



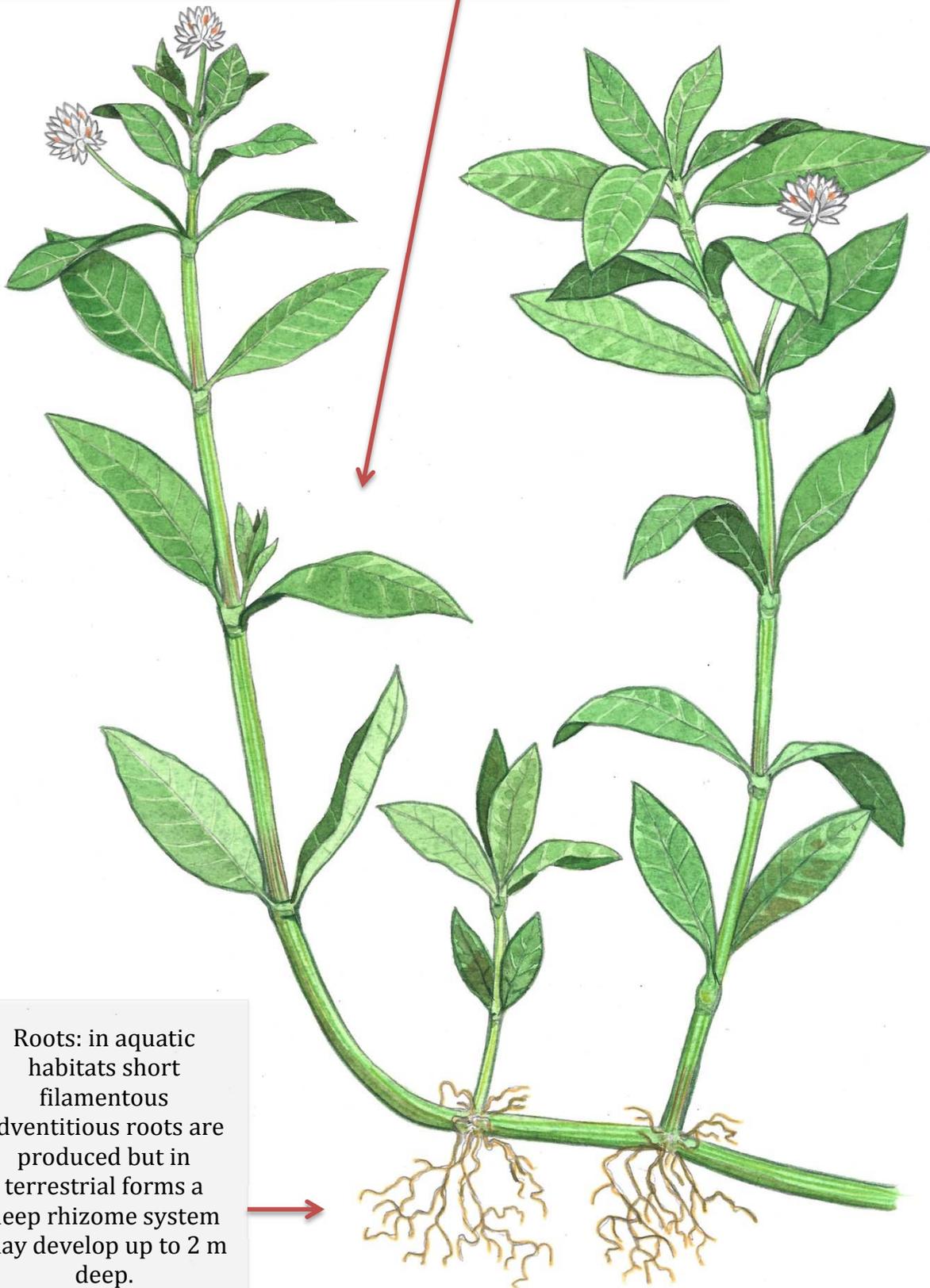
Size: Plants up to 60 cm tall, floating stems may extend up to 15 meters long,

Disclaimer:

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

Distinctive characteristics

Stems: simple or branched, often rooting at nodes, ascending from a creeping base in terrestrial forms up to 60 cm tall, fistulose when mature, in aquatic environment the internodes increasing in diameter, longer and hollow and stems up to 15 m long.



Roots: in aquatic habitats short filamentous adventitious roots are produced but in terrestrial forms a deep rhizome system may develop up to 2 m deep.

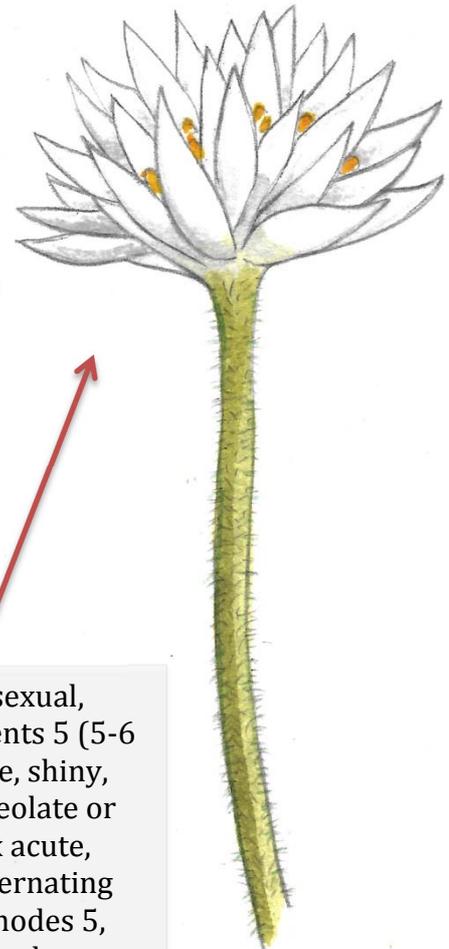
Leaves: bright green, ovate-lanceolate (2)3.5-7(10) cm in length and 0.5-2 cm wide, petiolate, arranged in opposite pairs. Mid-vein prominent on both sides of leaf.



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

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.



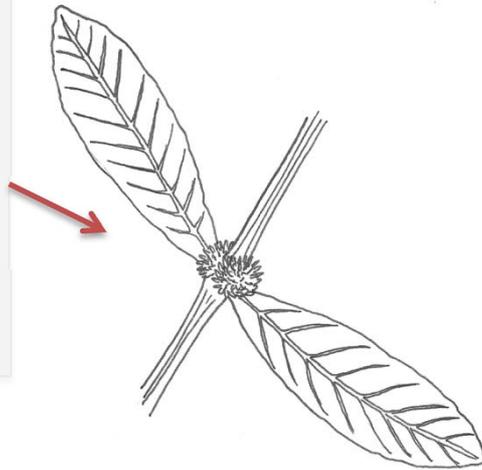
Similar species

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.

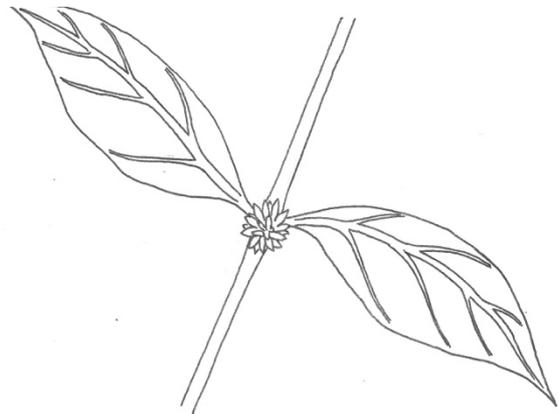
Alternanthera sessilis

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.



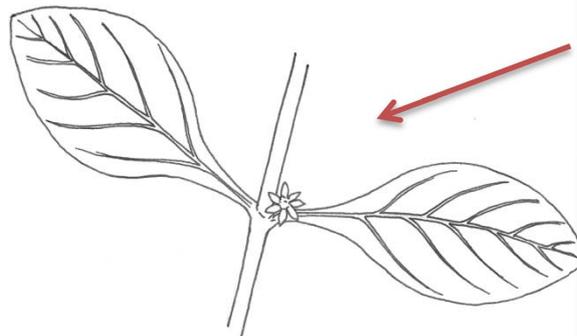
Alternanthera reineckii

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.

Common names

BG	-
HR	Krokodilska trava
CS	plevuňka (philoxeroides)
DA	Alligator-urt
NL	alligatorkruid
EN	Alligator weed
ET	vesi-kõlupea
FI	vesikajalehti
FR	Herbe à Alligator (Alternanthere)
DE	Alligatorkraut
EL	-
HU	aligátorfű

GA	-
IT	Erba degli alligatori (Madonna dell'Acqua)
LV	-
LT	sausalapė alstė
MT	-
PL	-
PT	tripa-de-sapo (erva-de-jacaré)
RO	-
SK	papagájovec
SL	aligatorska alternantera
ES	Hierba del lagarto (Huiro verde)
SV	-

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/EPPPO 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 Pfingsten, 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)

Procambarus fallax f. *virginalis*

Marmorkrebs, marbled crayfish

Synonyms

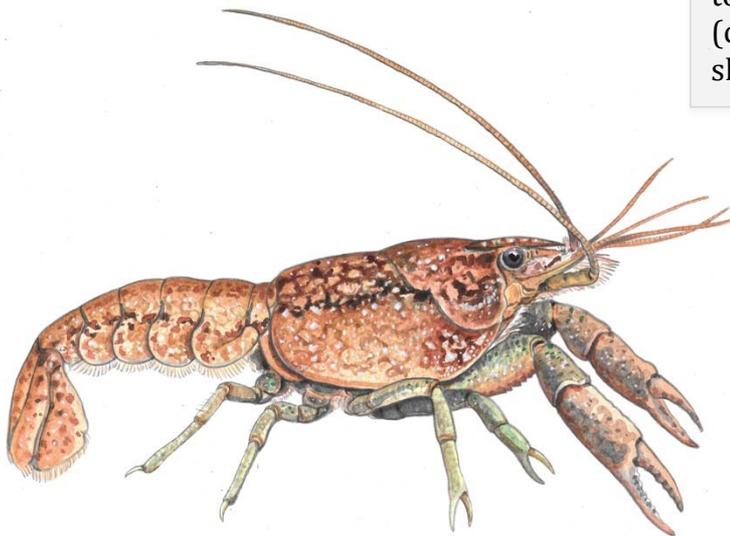
Procambarus sp.

Species ID

Kingdom: Metazoa
Phylum: Arthropoda
Class: Malacostraca
Order: Decapoda
Family: Cambaridae
Genus: *Procambarus*
Species: *Procambarus fallax* f. *virginalis*

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

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

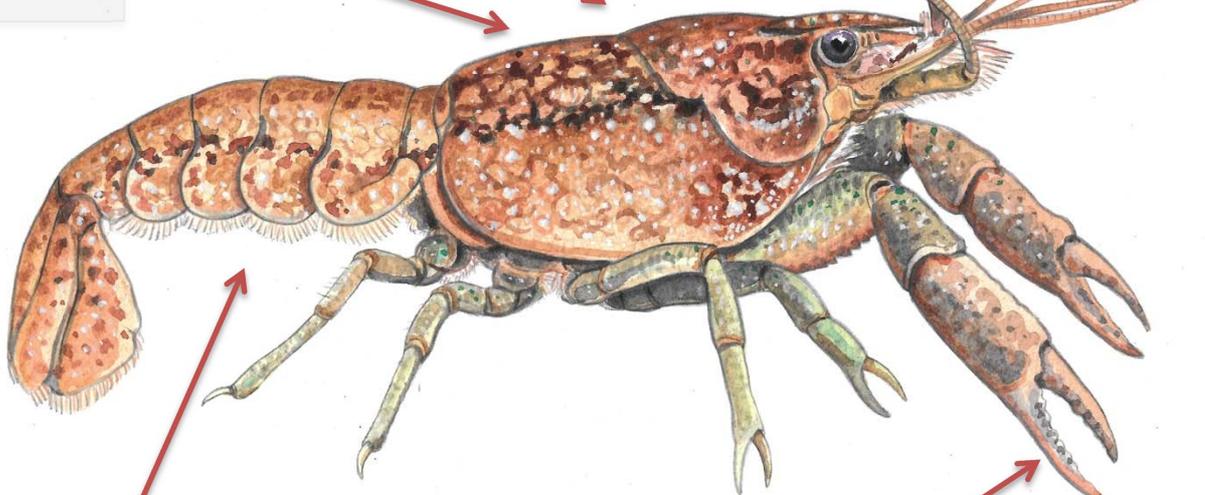
Carapace: dark lateral horizontal stripes through the carapace and pleon, flanked ventrally by a light-coloured area.

Carapace: smooth, with lateral surface slightly granulated, acute cervical spine present at each side. Row of tubercles on shoulders of carapace behind cervical groove. One pair of postorbital ridges and one pair of prominent hepatic spines and some nodules.

Carapace: indistinct median light tan stripe from rostrum to caudal margin of carapace.

Rostrum: prominent, with smooth borders tapering to a small, triangular acumen. Median carina absent.

Areola: open, approximately four times as long as wide.



Ventral side: dirty white to beige coloured, with dark and white tubercles extending to the median ventral surface of the chelae palms.

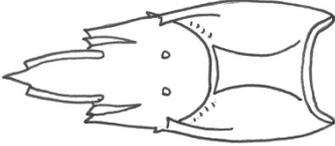
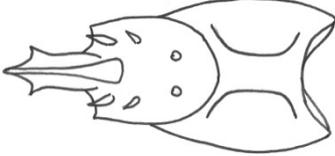
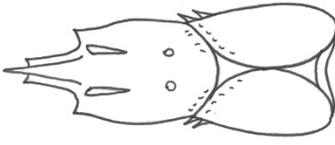
Walking legs: coloured uniformly, ranging from tan to greenish or blue.

Movable finger slightly longer than medial margin of the fixed one. Dorsal surface of fixed finger weakly granulated; upper and lower surface of chelae also marbled. Prominent spur on inferior margin of cheliped carpus.

Chelae (claws): small, mottled with dark tubercles, weakly granulate. Fixed finger elongated, with two tubercles on inner margin.

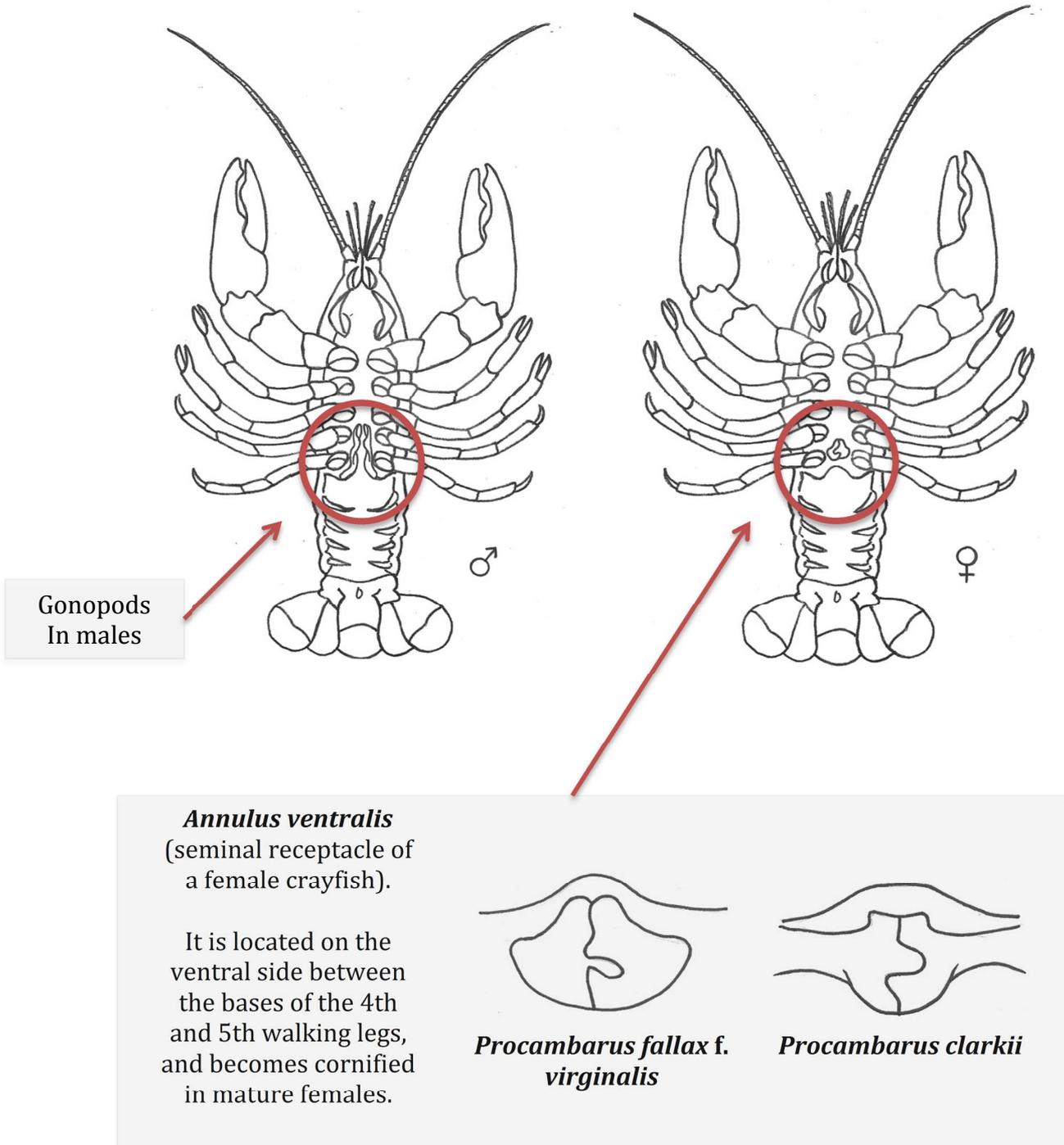
Similar species

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

<i>Procambarus fallax</i> Very similar to <i>Procambarus fallax f. virginalis</i> . Marble pattern less evident	<i>Procambarus acutus</i> and <i>Procambarus zonangulus</i> 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.	<i>Procambarus alleni</i> 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, ticker.
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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.

Common names

BG	-
HR	Mramorni rak
CS	rak mramorovaný
DA	Marmorkrebs
NL	Marmerkreeft
EN	Marbled crayfish (Deceitful Crayfish)
ET	marmorvähk
FI	Marmorirapu (supi)
FR	Écrevisse marbrée
DE	Marmorkrebs
EL	-
HU	virginiai márványrák

GA	-
IT	Gambero marmorato
LV	marmorvēzis
LT	marmurinis vėžys
MT	-
PL	rak marmukowy
PT	Lagostim-mármore
RO	Rac marmorat
SK	rak mramorový
SL	marmornati škarjar
ES	cangrejo originario de América
SV	marmorkräfta

Key references

CABI (2017). *Procambarus fallax* f. *virginialis* (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.

Tamias sibiricus

Siberian chipmunk, Asian chipmunk

Synonyms

Eutamias sibiricus (Laxmann, 1769)³

Species ID

Kingdom: Metazoa
Phylum: Chordata
Class: Mammalia
Order: Rodentia
Family: Sciuridae
Genus: *Tamias*
Species: *Tamias sibiricus*



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.

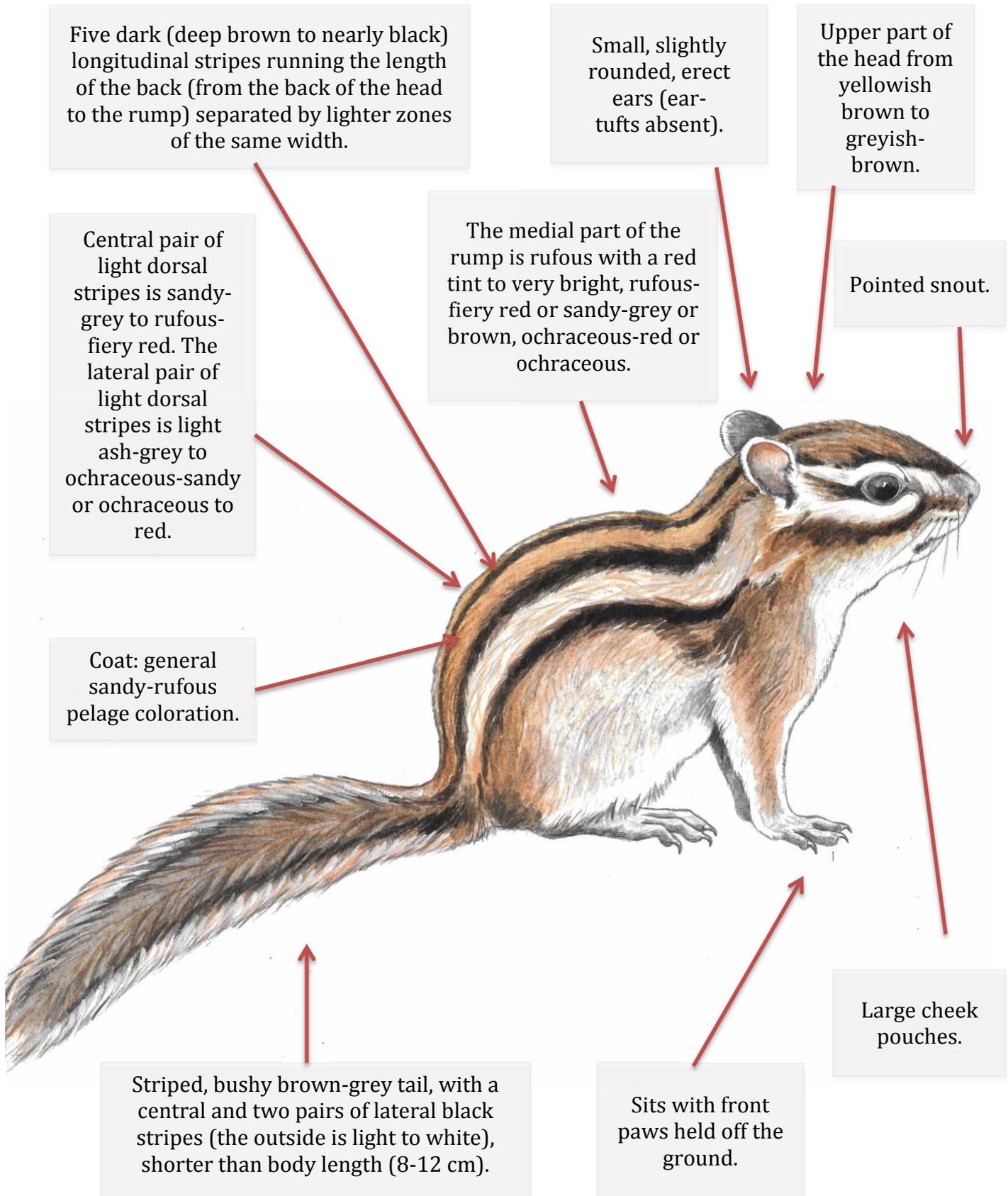
Size: Total length 18-25 cm, of which 40–50% is represented by the tail. Weight: 80-100 g.

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.

³ The scientific name now accepted is *Eutamias sibiricus*, while *Tamias sibiricus* is a synonym
See Patterson, B. D. & Norris, R. W. (2016). Towards a uniform nomenclature for ground squirrels: the status of the Holarctic chipmunks. *Mammalia*, 80(3): 241–251. DOI: [10.1515/mammalia-2015-0004](https://doi.org/10.1515/mammalia-2015-0004).
Tsytulina, K., Formozov, N., Shar, S., Lkhagvasuren, D. & Sheftel, B. (2016). *Eutamias sibiricus*. (errata version published in 2017) The IUCN Red List of Threatened Species 2016: e.T21360A115161465

Distinctive characteristics

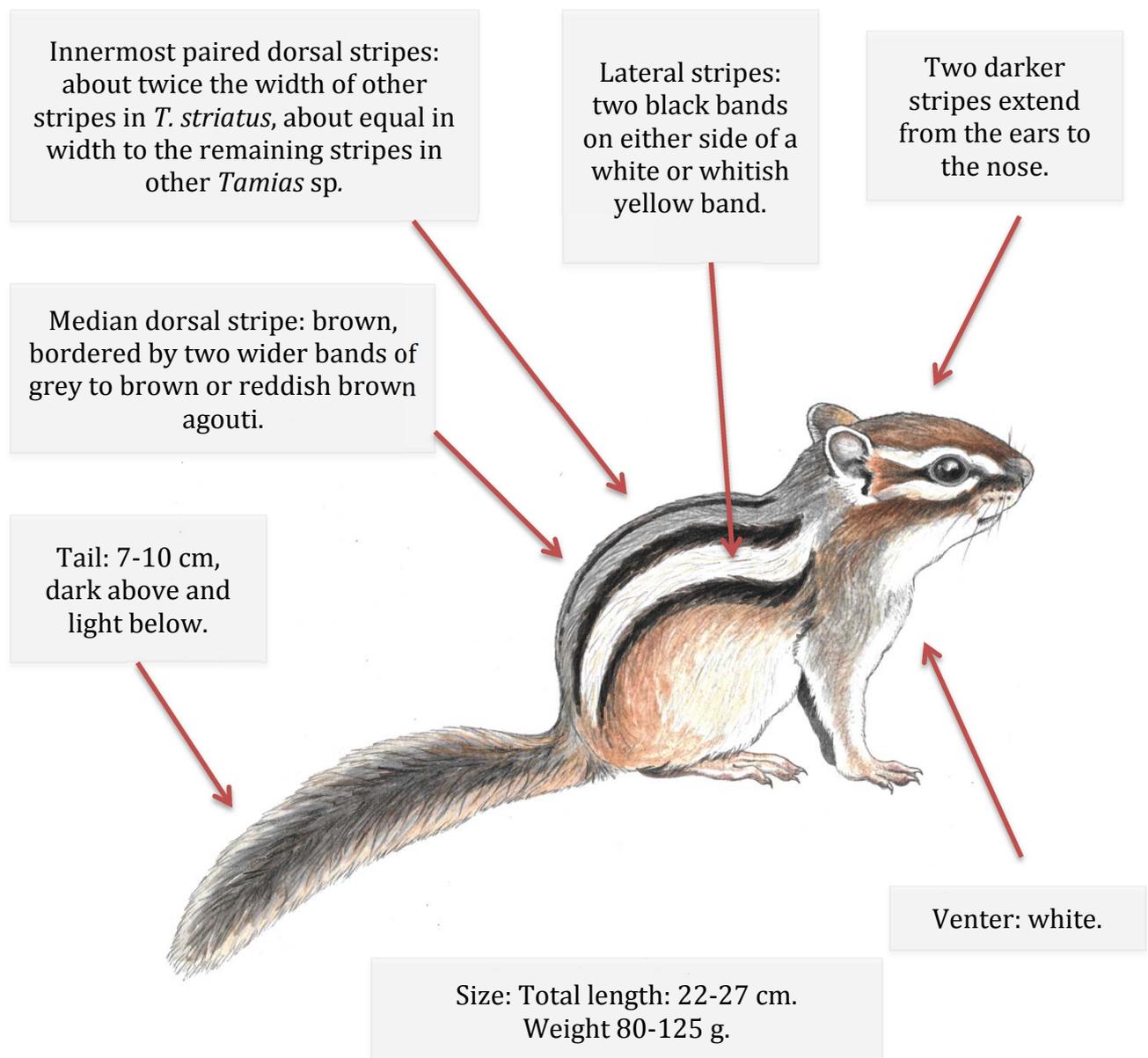


Similar species

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.

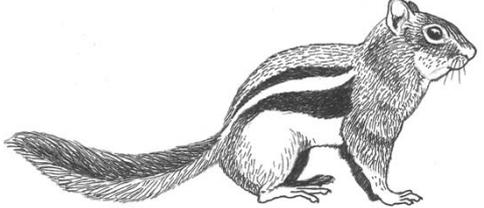
Tamias striatus

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



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.

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 *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.

Size		Colour	Stripes
	<i>Funambulus pennantii</i>		
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>		
Head-body: 18-20 cm, tail 13-14 cm. Weight 170- 190 g		Dorsal agouti ⁴ 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>		
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>		
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.

⁴ Agouti: greyish colour with a brindled appearance.

Common names

BG	Азиатски бурундук	GA	Iora talún Sibéarach
HR	Sibirski burunduk	IT	Tamia siberiano o borunduk
CS	Burunduk páskovaný	LV	Sibīrijas burunduks
DA	Sibirisk jordegern	LT	sibirinis burundukas
NL	Aziatische gestreepte grondeekhoorn	MT	-
EN	Siberian Chipmunk	PL	Burunduk
ET	siberi vöötorav (burundukk)	PT	Esquilo-siberiano (Esquilo-da-Sibéria)
FI	siperianmaaorava	RO	Veveriță siberiană
FR	Écureuil de Corée (Écureuil japonais)	SK	burunduk pruhovaný
DE	Sibirisches Streifenhörnchen	SL	sibirski burunduk
EL	-	ES	Ardilla de Siberia
HU	szibériai csíkosmókus (burunduk)	SV	sibirisk jordekorre

Key references

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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.

Callosciurus erythraeus

Pallas's squirrel, Red-bellied tree squirrel

Synonyms

N/A

Species ID

Kingdom: Metazoa
Phylum: Chordata
Class: Mammalia
Order: Rodentia
Family: Sciuridae
Genus: *Callosciurus*
Species: *Callosciurus erythraeus*

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.

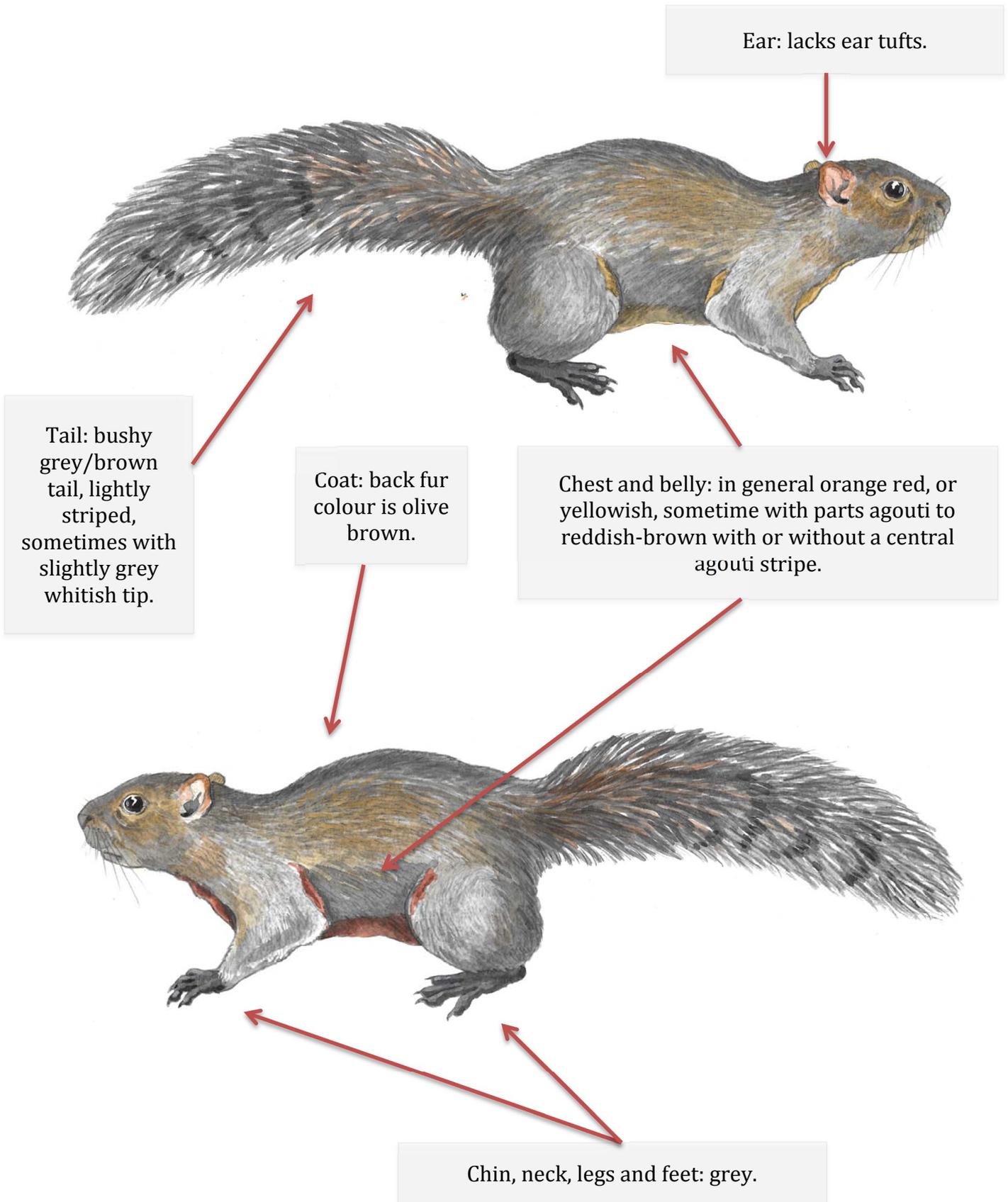


Size: Head-body length of 20-26 cm, tail length of 16-20 cm. Weight: 210-435 g.

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.

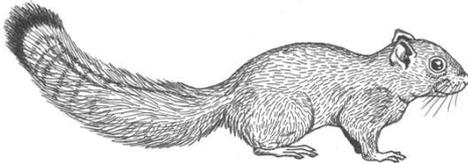
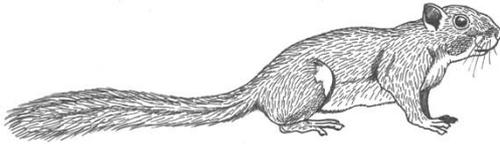
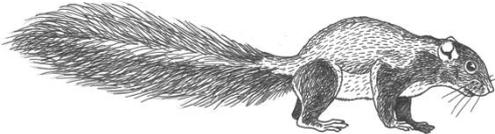
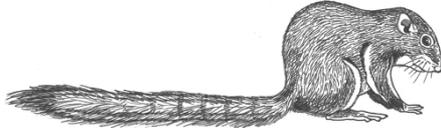
Distinctive characteristics



Similar species

It is difficult to distinguish *C. erythraeus* from other species in the same genus; for example, some forms have the entire ventral pelage agouti⁵ 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 caniceps</i>	
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>	
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>	
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>	
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.

⁵ Agouti: greyish colour with a brindled appearance

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 analysis 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).

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Wilson, D.E. and Reeder, D.M. (2005) *Mammal Species of the World: A Taxonomic and Geographic Reference*. JHU Press.

Common names

BG	-
HR	pallasova vjeverica
CS	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

GA	-
IT	Scoiattolo 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	Rödmagad trädekorre (pallasekorre)

Key references

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)

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