Gorteria – Dutch Botanical Archives 43, 2021: 027–034
ISSN (online) 2542-8578

SHORT COMMUNICATION

Carex ×*terschellingensis* hybr. nov. [= *Carex acuta* × *C. trinervis*] and *Carex* ×*reichgeltii* hybr. nov. [= *Carex acuta* × *C. aquatilis*], Cyperaceae, found in the Netherlands

J. Koopman[1], H. Więcław[2], H. Waltje[3]

Key words

Carex ×*terschellingensis*
Carex ×*reichgeltii*
Carex acuta
Carex trinervis
Carex aquatilis
Netherlands

Abstract – Hitherto, the extremely rare hybrid of *Carex acuta* and *C. trinervis* has worldwide only been found in the Netherlands. The hybrid was first found in 1952 on the island of Terschelling (Province of Fryslân), while the latest find, in 2014, is also from Terschelling. Therefore, the authors provide here this hybrid with the name *Carex* ×*terschellingensis*. Furthermore a type has been selected. Apart from the occurrence on Terschelling, the hybrid is also known from Meijendel (Province of Zuid-Holland), where it was found in 1978.

The hybrid between *Carex acuta* and *C. aquatilis* is known from the United Kingdom, the Netherlands (this study), Germany, Norway, Sweden, Finland, Estonia, Latvia, and Russia, but was lacking so far a binomial name. The name *Carex* ×*reichgeltii* is here proposed for this hybrid. The name is in honour of Theodorus Johannes Reichgelt (1903–1966), a Dutch botanist who paid a lot of attention to the genus *Carex* in the Netherlands. Furthermore, a type has been selected for this hybrid.

Samenvatting – De uiterst zeldzame hybride van *Carex acuta* (Scherpe zegge) en *C. trinervis* (Drienervige zegge) is wereldwijd tot nog toe alleen maar bekend van Nederland. Deze hybride werd voor het eerst gevonden in 1952 op het eiland Terschelling (provincie Fryslân). De meest recente vondst, van 2014, dateert eveneens van Terschelling. Daarom voorzien de auteurs deze hybride hier van de naam *Carex* ×*terschellingensis*. Tevens is er een type aangewezen. Behalve van Terschelling is deze hybride eveneens bekend van Meijendel (provincie Zuid-Holland), waar de hybride in 1978 werd aangetroffen.

De hybride tussen *Carex acuta* en *C. aquatilis* (Noordse zegge) is bekend van het Verenigd Koninkrijk, Nederland (dit onderzoek), Duitsland, Noorwegen, Zweden, Finland, Estland, Letland en Rusland, maar er ontbrak tot nu toe een binaire naam. Als naam voor deze hybride wordt hier de naam *Carex* ×*reichgeltii* voorgesteld. Dit ter ere van Theodorus Johannes Reichgelt (1903–1966), een Nederlandse botanicus die veel aandacht heeft besteed aan het geslacht *Carex* in Nederland. Voorts is er een type voor deze hybride gekozen.

Published on 30 March 2021

INTRODUCTION

The genus *Carex* L. counts worldwide roughly around 2000 species (Reznicek 1990), more precisely 2002 (Govaerts et al., World Checklist of Monocotyledons, accessed March 2020), in around 70 sections (Egorova 1999). Within some of these sections hybridisation is relatively common: *Glareosae* Don, *Ceratocystis* Dumort., *Vesicariae* Heuffel, and *Phacocystis* Dumort. (Cayouette & Catling 1992; Jermy et al. 2007; Koopman 2010; Więcław 2014; Więcław & Koopman 2013; Więcław & Wilhelm 2014).

[1] ul. Kochanowskiego 27, 73-200 Choszczno, Poland;
e-mail: jackoopman@e-cho.pl
[2] Institute of Marine and Environmental Sciences, University of Szczecin, Adama Mickiewicza 18, 70-383 Szczecin, Poland;
e-mail: helena.wieclaw@usz.edu.pl
[3] Foswerd 72, 9202 BA Drachten, Netherlands;
e-mail: harrywaltje@gmail.com

corresponding author e-mail: jackoopman@e-cho.pl

© 2021 Naturalis Biodiversity Center, FLORON & KNBV

You are free to share - to copy, distribute and transmit the work, under the following conditions:
Attribution: You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).
Non-commercial: You may not use this work for commercial purposes.
No derivative works: You may not alter, transform, or build upon this work.
For any reuse or distribution, you must make clear to others the license terms of this work, which can be found at creativecommons.org/licenses/by-nc-nd/3.0/legalcode. Any of the above conditions can be waived if you get permission from the copyright holder. Nothing in this license impairs or restricts the author's moral rights.

The section *Phacocystis* contains 19 species and 56 hybrids in Europe (Koopman 2015); besides, five hybrids with species from other sections have been recorded. Several *Carex* species within this section are supposed to be of hybrid origin, e.g. *C. recta* Boott and *C. salina* Wahlenb. (Cayouette & Morisset 1985), so-called stabilised hybrids. In the Netherlands, six species from the section *Phacocystis* are known: *C. acuta* L., *C. aquatilis* Wahlenb., *C. cespitosa* L., *C. elata* All., *C. nigra* (L.) Reichard, and *C. trinervis* Degl. (Duistermaat 2020). These six species could generate 6 × 5 / 2 = 15 hybrids. Seven of them do occur in the Netherlands, of which five have been provided with a name: *C.* ×*elytroides* Fr. [*C. acuta* × *C. nigra*], *C.* ×*hibernica* A. Benn. [*C. aquatilis* × *C. nigra*], *C.* ×*prolixa* Fr. [*C. acuta* × *C. elata*], *C.* ×*timmiana* Junge [*C. nigra* × *C. trinervis*], and *C.* ×*turfosa* Fr. [*C. elata* × *C. nigra*]. The other two hybrids occurring in the Netherlands did not have a binomial name yet: *C. acuta* × *C. trinervis* and *C. acuta* × *C. aquatilis* (Koopman 2010). We therefore provide both with a binomial name here.

The hybrid between *Carex acuta* and *C. trinervis* is hitherto only known from the Netherlands (Kern & Reichgelt 1954; Koopman 2010). *Carex acuta* is widespread over Europe; it is only absent from Iceland and Corsica (Koopman 2015). On the other hand, *C. trinervis* is a Western European coastal endemic species, which is restricted to Denmark, Germany, the Netherlands, Belgium, France, Spain, and Portugal (Foley 2005). In the United Kingdom it was only known from one location on the east coast, where it was present between 1869 and 1890 (Jermy et al. 2007).

The hybrid between *Carex acuta* and *C. aquatilis* is currently known from the United Kingdom (Jermy et al. 2007), Germany (Kiffe 1998), Estonia and Latvia (Kuusk et al. 2003), Norway, Sweden, Finland, Russia (Koopman 2015), and the Netherlands (this study).

MATERIAL AND METHODS

The authors have studied all collections of the supposed hybrid of *C. acuta* × *C. trinervis* that are preserved in L, as well as additional material collected by Waltje (third author) in 2014 on Terschelling, Province of Fryslân (see Appendix). By means of a loan from H, we were able to study material of *C. acuta* × *C. aquatilis* (see Appendix). Material that is preserved in B has been studied during a herbarium visit in Berlin, Germany.

Nomenclature of carices follows Koopman (2015); herbarium acronyms follow Thiers (2019+). Type material of the hybrid of *C. acuta* × *C. aquatilis* has been deposited in L, isotypes have been deposited at SZUB and in the first author's private herbarium.

RESULTS

Carex acuta L. × *C. trinervis* Degl.

Nine sheets with material of the supposed hybrid of *Carex acuta* × *C. trinervis* are present in L, concerning eight collections. Six of them are from the island of Terschelling. The first collection was made on 3 August 1952, four others were also made in the 1950s, but the last collection was made in 1984. One collection is from Meijendel (Province of Zuid-Holland), where B. Kruijsen found the hybrid on 28 June 1978. The collection from Staphorst (Province of Overijssel) from 7 August 1980, made by A. Corporaal, proved to be erroneous; as mentioned before (Koopman 2010) this concerns aberrant *C. nigra* material.

The recent find of *Carex acuta* × *C. trinervis* in 2014 shows that after more than sixty years, the hybrid still occurs on the island of Terschelling (see Appendix). As this hybrid had no binomial name yet, we therefore provide it with a name here:

***Carex* × *terschellingensis* Jac. Koopman, Więcław & Waltje**, hybr. nov. [= *Carex acuta* L. × *C. trinervis* Degl.] — Fig. 1 & 2

Type: The Netherlands, Province of Fryslân, island of Terschelling, "paadje tussen Loopduin en Biol. Stat."; coordinates: Dutch atlas block 01-54; 3 August 1952; *leg. Mörzer Bruyns*; (Holotype: sheet L.3125491; see also Fig. 1).

Plant perennial, monoecious, rhizomatous, dull green, glabrous. Leaves 20–35 cm × 2 mm, keeled; stomata on both sides of the leaves (amphistomous); lowest leaf sheaths brown; ligule rounded with red-brown free margin. Flowering stems 55–75 cm long, triangular, smooth. Inflorescence up to 22 cm long, with 3–4 male spikes at the top, male top spike up to 8 cm × 4 mm, 2–3 female spikes below, 2–5 cm × 5–6 mm, oval-cylindric; male glumes 6.5–7 × 1.2–1.6 mm, brown with lighter midrib and hyaline margin, apex rounded; female glumes 3.8–4.3 × 0.8–1.3 mm, dark red-brown with wide pale midrib, apex sometimes mucronate, longer than the utricles; lowest bract(s) up to 32 cm × 3 mm, far exceeding the inflorescence. Utricles 3.3–3.7 × 1.6–1.8 mm, light brown, glabrous, rounded, flat, nerved, with short, truncate, 0.1–0.2 mm long beak, empty, nuts not developed, sterile; stigmas 2.

Distribution and habitat — This hybrid is only known to occur in the Netherlands. The seven collections from L and the one made by Waltje in 2014 come from four locations, i.e. three from the island of Terschelling and one from Meijendel; see Appendix and Fig. 2. The hybrid grows in wet dune valleys.

Etymology — Named after the island of Terschelling (Province of Fryslân, the Netherlands), where it has been found and collected several times, also recently.

Comparison hybrid and parental species — *Carex* × *terschellingensis* differs from its parent *C. acuta* in having stomata on both sides of the leaves (see also Wallnöfer 2006) and from both parents in its irregularly wrinkled and shrunken, empty utricles. The hybrid looks at first sight like a small *C. acuta*, but with smooth stems, while *C. acuta* has sharp and rough stems and stomata only on the backside of the leaves. From *C. trinervis* it differs in the dull green colour of the plant; *C. trinervis* has a glaucous colour, smooth flowering stems and mostly well-developed utricles. The male top spike of *C.* × *terschellingensis* is about 8 cm long, whereas the one of *C. trinervis* is 5 cm long.

Carex acuta L. × *C. aquatilis* Wahlenb.

During fieldwork in June 2018 we found an interesting *Carex* plant in the Province of Fryslân, the Netherlands. At first sight it looked like *C. acuta*, a tall plant with sharp and rough triangular stems, but with reddish lower leaf sheaths and empty utricles, reminding of a hybrid. After detailed literature studies (e.g. Jermy et al. 2007; Kiffe 1998, 2004; Wallnöfer 2006), morphological observations, and a comparison with herbarium material from B, H, and L, we are convinced that the plant found in 2018 represents the hybrid *C. acuta* L. × *C. aquatilis* Wahlenb. It grew together with both parental species, which both belong to section *Phacocystis*, in which many hybrids are spontaneously being generated (Cayouette & Catling 1992).



Fig. 1. Holotype of *Carex* × *terschellingensis* Jac. Koopman, Więcław & Waltje. Photo: Naturalis Biodiversity Center, Leiden, the Netherlands.



Fig. 2. Distribution map of the global distribution of *Carex* ×*terschellingensis* Jac.Koopman, Więcław & Waltje as it is currently known. The hybrid occurs in only four atlas blocks (5 × 5 km²) in the Netherlands. Map: R. Haveman, 2016.

In this paper we provide the hybrid of *C. acuta* and *C. aquatilis* with a binomial name and a description:

***Carex* ×*reichgeltii* Jac.Koopman, Więcław & Waltje**, hybr. nov. [= *Carex acuta* L. × *C. aquatilis* Wahlenb.] — Fig. 3

Type: The Netherlands, Province of Fryslân, De Putten, NW of the Leijen (lake), SW of Eastermar; Magnocaricion; coordinates: N 53°9'58.86" – E 06°3'24.804"; Dutch atlas km² grid cell: 06.54.55; 13 June 2018; leg. & det. Jac. Koopman & H. Więcław (Holotype L: sheet L 0608421; isotypes: SZUB, sheet 033934; private herbarium Jac. Koopman, sheet 43.2.246.1/1a/1b) (see also Fig. 3).

Plant perennial, monoecious, rhizomatous, dull green, glabrous. Leaves to 80 cm × 5–6 mm, with abundant stomata on both sides; lowest leaf sheaths dark reddish-brown, entire; ligule triangular, longer than wide, with a red-brown free margin. Flowering stems 1.00–1.50 m tall, sharply triangular, rough, upright, in the lower part with leaves. Inflorescence up to 30 cm, mostly with 3 male spikes at the top and 3–4 female spikes; uppermost male spike c. 6 cm × 3 mm; female spikes 5–9 cm × c. 5 mm, long and narrow, slightly pendent; male glumes 4.5–4.9 × 0.4–0.8 mm, light brown, with narrow hyaline margin, narrow and acute; female glumes 2.7–2.9 × 0.8–0.9 mm, blackish-purple with lighter midrib, narrower and longer than the utricles, acute; lowest bract to 35 cm × 5 mm, leaf like, far exceeding the inflorescence. Utricles 2.9–3.1 × 1.5–1.7 mm,

Table 1. Comparison of *Carex* ×*terschellingensis* Jac.Koopman, Więcław & Waltje, *C.* ×*timmiana* Junge and *C.* ×*reichgeltii* Jac.Koopman, Więcław & Waltje. Diagnostic character states are printed in bold font.

Character	***Carex* ×*terschellingensis*** **[*C. acuta* × *C. trinervis*]**	***C.* ×*timmiana*** **[*C. nigra* × *C. trinervis*]**	***C.* ×*reichgeltii*** **[*C. acuta* × *C. aquatilis*]**
Stems	**55–75 cm**, smooth	(**25–**)**30**(**–40**) **cm**, smooth	**100–150 cm**, **rough**
Leaves	20–35 cm long	15–30 cm long	**up to 80 cm long**
Ligula	rounded, with red-brown margin	short triangular, top rounded with brown margin	triangular, **longer than wide**, with red-brown free margin
Inflorescence	**3–4 male spikes**, 2–3 female spikes	1**(–2) male spikes**, 2–3 female spikes	**3 male spikes**, **3–4 female spikes**
Lowest bract	far exceeding the inflorescence	exceeding the inflorescence	far exceeding the inflorescence
Female spikes	oval-cylindric	short oval-cylindric	long and narrow, slightly pendent
Male glumes	brown with hyaline margin, lighter midrib, top rounded	brown with hyaline margin, top rounded	light brown, with narrow hyaline margin, narrow and **acute**
Female glumes	**longer than utricles**, **dark red-brown with broad pale midrib**, **top sometimes mucronate**	**shorter than utricles**, **blackish purple-brown**, **light midrib ending before the top**, **top rounded**	**narrower and longer than the utricles**, **blackish-purple with lighter midrib**, **acute**
Utricles	light brown, round, flat, glabrous, veined, with short, truncate beak; stigmas 2; nut not developed	cream-brown with minute red spots, round, flat, glabrous, shortly stalked, faintly veined, with very short, truncate beak; stigmas 2; nut not developed	brown green, not shining, glabrous, oval, flat, with a short, 0.5–0.7 mm long stipe, with a short, truncate, 0.1–0.3 mm long beak; stigmas 2; nut not developed

brown green, not shining, glabrous, oval, flat, with a short, 0.5–0.7 mm long stipe, with a short, truncate, 0.1–0.3 mm long beak, empty, nuts not developed; stigmas 2.

Distribution and habitat — This hybrid is currently known from the United Kingdom (Jermy et al. 2007), Germany (Kiffe 1998), Estonia and Latvia (Kuusk et al. 2003), Norway, Sweden, Finland, Russia (Koopman 2015), and the Netherlands (this research). It grows on lakesides, riversides, along ditches and in wet meadows, generally with both parents.

Etymology — Named after Theodorus Johannes Reichgelt (1903–1966), who intensively studied the genus *Carex* in the Netherlands. Together with his friend Johannes Hendrikus Kern (1903–1974) he wrote, among many other publications on the Dutch flora, the volume of Flora Neerlandica about *Carex* (Kern & Reichgelt 1954).

Comparison hybrid and parental species — *Carex* ×*reichgeltii* differs from its parents in having stomata on both sides of the leaves (see also Wallnöfer 2006) and irregularly wrinkled and shrunken empty utricles. The hybrid resembles at first sight *C. acuta*, which also have rough and sharp trigonous stems (compare Jermy et al. 2007), but it has red-brownish lowest leaf sheaths, while *C. acuta* has white membranous lowest leaf sheaths. Besides, the hybrid has shorter female spikes. From *C. aquatilis* the hybrid differs in the glaucous colour of the plant, and the rough and sharp trigonous flowering stems. *Carex aquatilis* has an olive-green colour, smooth flowering stems and mostly well-developed utricles. For further comparison of the hybrid with its parents, see Jermy et al. (2007: p. 471).

DISCUSSION

Because of the empty utricles with undeveloped nuts, it is clear that in both cases we are dealing with a hybrid. The two stigmas and the flat utricles show further that these hybrids belong to section *Phacocystis*. The rhizomatous growth excludes the tussock forming *Carex elata* (and also *C. cespitosa*, which is extremely rare in the Netherlands and, moreover, does not occur on the sites of these hybrids).

Taking into account that *Carex aquatilis* does not occur on Terschelling nor in the Province of Zuid-Holland, only a few options are left for the identity of the first hybrid treated in this study: *C.* ×*elytroides* [*C. acuta* × *C. nigra*], *C.* ×*timmiana* [*C. nigra* × *C. trinervis*], and *C. acuta* × *C. trinervis*. All three have stomata on both sides of the leaves due to the parental species *C. nigra* and / or *C. trinervis*. *Carex* ×*elytroides* is about 35–45 cm tall and has sharp and rough stems and resembles at first sight a (too) tall *C. nigra* and a too small *C. acuta*, but with empty utricles. Its inflorescence has only a single male spike at the top. Hence, our first hybrid cannot be *C.* ×*elytroides*. Both two remaining hybrids, *C. acuta* × *C. trinervis* and *C.* ×*timmiana*, have smooth stems, which they inherited from their parental species *C. trinervis*. The hybrid *C. acuta* × *C. trinervis* is 55–75 cm tall, while *C.* ×*timmiana* is 25–40 cm tall. Furthermore, the inflorescence of the former has 3–4 male spikes, whereas the inflorescence of *C.* ×*timmiana* has only one male spike, or sometimes a much shorter second one. For a more detailed overview of the differences between the two hybrids of *C. trinervis*, see Table 1. Because of the size of our hybrid and the 3–4 male spikes at the top of the inflorescence, our first hybrid is the hybrid of *C. acuta* with *C. trinervis*, and not that of *C. nigra* with *C. trinervis*.



Fig. 3. Holotype of *Carex* ×*reichgeltii* Jac. Koopman, Więcław & Waltje . Photo: Naturalis Biodiversity Center, Leiden, the Netherlands.

Worldwide only two hybrids of *Carex trinervis* are known, with *C. acuta* and with *C. nigra*. The latter, *C.* ×*timmiana*, is known from Denmark, Germany, the Netherlands, Belgium, and France (Koopman 2015). Despite the limited distribution of its parent *C. trinervis* in only seven West and Southwest European countries, mainly in the coastal area (Foley 2005; Koopman 2015), *C.* ×*timmiana*, is relatively common in the aforementioned countries (Koopman 2015). Where the two parents grow together in coastal habitats, this hybrid is often easily generated.

It is questionable why the other hybrid, the Dutch endemic *C.* ×*terschellingensis*, occurs, apart from the find in Meijendel in 1978, so far only on Terschelling. It seems to be an extremely rare hybrid. It may be overlooked at sites elsewhere, or perhaps the two parental species do not often grow together. Hopefully this article can contribute to a more complete picture of its real occurrence in West and Southwest Europe.

Many *Carex* hybrids lack a binomial name and some of those hybrids are more or less doubtful. However, both hybrids in this article are relatively well recognisable, and are either long-term present and/or easily generated. Hence they deserve the binomial name that is provided in this study.

Acknowledgements – We are grateful to Christel Schollaardt, head of herbarium collections, and to Marnel Scherrenberg, collection manager, both from Naturalis Biodiversity Center, Leiden, the Netherlands (L), for a loan of all *Carex acuta* × *C. trinervis* material in L and for their kind assistance during our visit to Leiden in October 2019. We thank Henry Väre (H, Finnish Museum of Natural History, Helsinki, Finland) for the loan of some material of *C. acuta* × *C. aquatilis* and Robert Vogt, curator of the herbarium of the Botanical Garden and Botanical Museum Berlin-Dahlem, Germany (B), for allowing us access to their *Carex* collection. Ruud Beringen (FLORON, the Netherlands) is being thanked for preparing the map. We thank Rafaël Govaerts (Kew, United Kingdom) for his invaluable advice, and the editors of Gorteria for their improvements.

REFERENCES

Cayouette J, Catling PM. 1992. Hybridization in the genus Carex with special reference to North America. Bot. Rev. (Lancaster) 58: 351–438.

Cayouette J, Morisset P. 1985. Chromosome studies on natural hybrids between maritime species of Carex (sections Phacocystis and Cryptocarpae) in northeastern North America, and their taxonomic implications. Canad. J. Bot. 63: 1957–1982.

Duistermaat H. 2020. Heukels' Flora van Nederland, ed. 24. Noordhoff Uitgevers, Groningen.

Egorova TV. 1999. The sedges (Carex L.) of Russia and adjacent states (within the limits of the former USSR). St. Petersburg State Chemical-Pharmaceutical Academy, St. Petersburg.

Foley MJY. 2005. Carex trinervis Degl. (Cyperaceae) – a western European coastal endemic. Candollea 60: 87–95.

Govaerts R, Jiménez-Mejías P, Koopman J, Simpson D, Goetghebeur P, Wilson K, Egorova T, Bruhl J. Continously updated. World checklist of Monocotyledons. The Board of Trustees of the Royal Botanic Gardens, Kew. Available at http://apps.kew.org/wcsp/monocots/ (accessed 6 March 2020).

Jermy AC, Simpson DA, Foley MJY, Porter MS. 2007. Sedges of the British Isles. Handbook 1, 3rd ed. Botanical Society of the British Isles, London.

Kern JH, Reichelt TJ. 1954. Cyperaceae, Carex. In: van Soest JL, Heimans J, van Ooststroom SJ, Flora Neerlandica 1, 3. Koninklijke Nederlandse Botanische Vereniging, Amsterdam.

Kiffe K. 1998. Der Erstfund einer Carex aquatilis-Hybride in Mitteleuropa: ein Vorkommen von Carex acuta L. × C. aquatilis Wahlenb. in Nordwestniedersachsen. Florististische Rundbriefe 31: 132–135.

Kiffe K. 2004. Die bisher in Sachsen- Anhalt nachgewiesener Hybriden innerhalb der Gattung Carex (Cyperaceae). Mitteilungen floristische Kartierung Sachsen-Anhalt 9: 33–40.

Koopman J. 2010. Carex-hybriden in Nederland. Gorteria 34: 159–169.

Koopman J. 2015. Carex Europaea, volume 1. 2nd ed., e-book. Weikersheim.

Kuusk V, Tabaka L, Jankevičienė R. 2003. Flora of the Baltic countries, Compendium of Vasular Plants, Vol. 3. Tartu.

Thiers B. 2019+ (continuously updated). Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium, New York. (Accessed 6 March 2020).

Wallnöfer B. 2006. Die Verteilung der Stomata auf den Laubblättern als wichtiges diagnostisches Merkmal zur Unterscheidung der Arten und Hybriden in der Carex acuta- und C. rostrata-Verwandtschaft (Cyperaceae). Neilreichia 4: 195–208.

Więcław H. 2014. Carex flava agg. (section Ceratocystis, Cyperaceae) in Poland: taxonomy, morphological variation, and soil conditions. Biodivers. Res. Conserv. 33: 3–88.

Więcław H. & Koopman J. 2013. Numerical analysis of morphology of natural hybrids between Carex hostiana and the members of Carex flava agg. (Cyperaceae). Nordic J. Bot. 31: 464–472.

Więcław H. & Wilhelm M. 2014. Natural hybridization within the Carex flava complex (Cyperaceae) in Poland: morphometric studies. Ann. Bot. Fenn. 51: 129–147.

APPENDIX

Studied material of *Carex acuta* × *C. trinervis*

L.3125491 (= L 0608422). *Carex acuta* × *C. trinervis*; Terschelling, NL; “Paadje tussen Loopduin en Biol. Stat.”, 01.54; *leg. Mörzer Bruyns*; 3 Aug 1952; **type material**, Fig. 1;

L.3125492. *Carex acuta* × *C. trinervis*; Terschelling, NL; “Tussen Biol. Stat. en Loopduin, wegje door vallei, dicht bij weiland”, 01.54; *leg. Th. Reichgelt*; 8 Aug 1952;

L.3125493. *Carex acuta* × *C. trinervis*; Terschelling, NL, 01.54; *leg. Th. Reichgelt*; 8 Aug 1952;

L.3125489-90. *Carex acuta* × *C. trinervis*; Terschelling, NL; “Sloot langs een weiland op de Dazenplak, tussen Biol. Stat. en Loopduin, dichtbij de eerste groeiplaats van *C. trin*. × *C. acuta*. Blad zeer lang (tot 1.50 m) en terugrollend. (Met *trinervis* en *nigra*, maar geen *acuta* gezien)”, 01.54; *leg. Th. Reichgelt*; 9 Aug 1952;

L.3125488. *Carex acuta* × *C. trinervis*; Terschelling, NL; “paal 19, op ± 15 mtr. Lange greppel Dazenplak”, 01.54; *leg. H.C. Wesseling*; 14 Jul 1955;

L.3125487. *Carex acuta* × *C. trinervis*; Meijendel, Zuid van Ganzenhoek, NL; 30.35.25; *leg. B. Kruijsen*; 28 Jun 1978;

L.3125486. *Carex nigra*; Staphorst, Ganzenplas, NL; *leg. A. Corporaal*; Jul/Aug. 1980 [originally inserted as *C. acuta* × *C. trinervis*];

L.3125485. *Carex acuta* × *C. trinervis*; Terschelling, NL; “Slootje langs grasland aan Duinweg, nabij Kooibosjes, 01.52.52”; *leg. T. Denters*; 11 Aug 1984;

Carex acuta × *C. trinervis*; Terschelling, NL; E of Koegelwieck; dune valley, on sand, 01.53.34; *leg. H. Waltje*; 27 Jun 2014.

Studied material of *Carex acuta* × *C. aquatilis*

Finland — Etelä-Häme. Ruovesi, Visuvesi, Kukonlahden NE-perukka, tulvaniitty ent. Tiilitehtaan luona (689:33); 21-8-1978; leg. *Niilo Söyrinki* (H). – Ostrobottnia media, Lappajawi, Karna Kannaulakti; sandstrand; 22-8-1905; leg. *A.L. Backman* (H). – Perä-Pohjanmaa (PeP/Obu). Pello. Juoksenki, Karminniemi. S-lahden N-ranta. 1 Mätäs. Grid 27 E 73926:3618; 18-7-1992; leg. *Tauno Ulvinen* (H). – Oulun Pohjanmaa (OP/Obo). Oulu. Kempeleenlathi, 150 S of the beach; Moist sedge-dominated sandy shore. Grid 27E: 72087:4286 Korkeus 0.3 m m.p.y., 13-7-2004; leg. *Henry Väre* 17805/361 (H). – Oulun Pohjanmaa (OP/Obo). Oulu. Rajahauta, N; Moist sedge-dominated meadow. Rare. 2 dupl. Grid 27E: 7219643:424910 Korkeus 0.3 m m.p.y., leg. *Henry Väre* 17994/306 (H). – Lk./Keml. Kittilä kk., Peräjärven tulvaniitty; 8-8-1966; leg. *Oiva J. Keskinen* (H).

Germany — Bavaria: in fossis silvaticis prope Nürnberg; 10-6-1902; leg. *I. Raulfuss* (B). – Grossenhain: In grossen Spitalteiche; 31-5-1906; leg. *H. Hofmann* (B). – Niedersachsen, Kreis Leer, zwischen West- und Ostrhauderfehn: In einen Graben im beweideten Feuchtgrünland am Nordwestrand des Langholter Meeres; 26-5-1997; leg. et det. *K. Kiffe* (B).

Netherlands — bij Wedderveen, Province of Groningen; begin juli 1904; leg. *W.M. Schipper s.n.*, (see Koopman 2010; seen in L, but unfortunately misplaced and therefore untraceable during our visit). – De Putten, NW of the Leijen (lake), SW of Eastermar, Province of Fryslân; co-ord.: 199.8-575.7; Dutch atlas square: 06.54.55; poor meadow on peat, large population around ditch; 7-6-2013; leg. *H. Waltje,* det. *Jac. Koopman* & *H. Więcław* (private herbarium H. Waltje); – De Putten, NW of the Leijen (lake), SW of Eastermar, Province of Fryslân; co-ord.: N 53°9′58.86″ – E 06°3′24.804″; Dutch atlas square: 06.54.55; Magnocaricion; 13-6-2018; leg. & det. *Jac. Koopman & H. Więcław* (**type material**: holo- L: sheet L 0608421; iso-: SZUB, sheet 033934, iso-: private herbarium Jac. Koopman, sheet 43.2.246.1/1a/1b) (see also Fig. 3).