Title: **Hybridization may endanger the rare North Apennine endemic *Cirsium bertolonii*.**

Journal: **Plant Systematics and Evolution**

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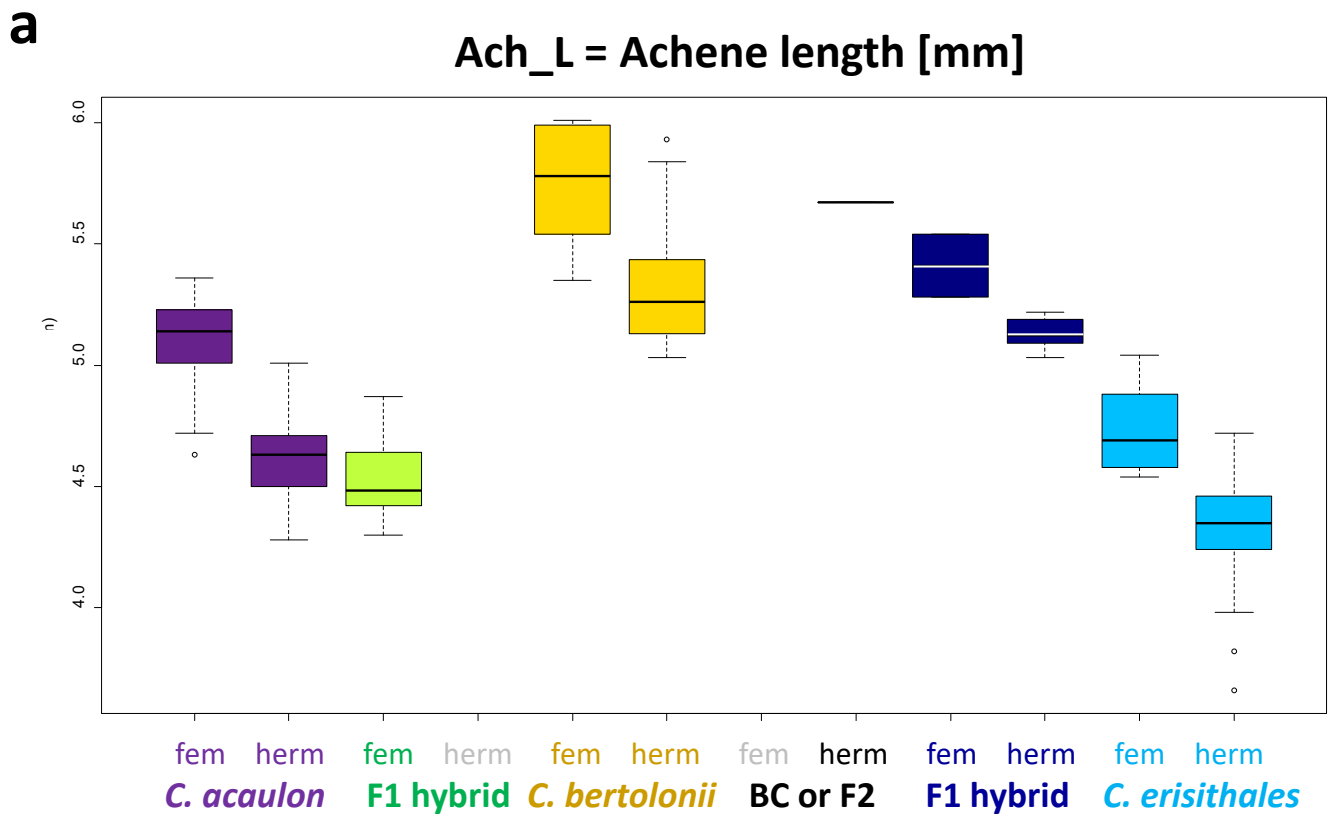
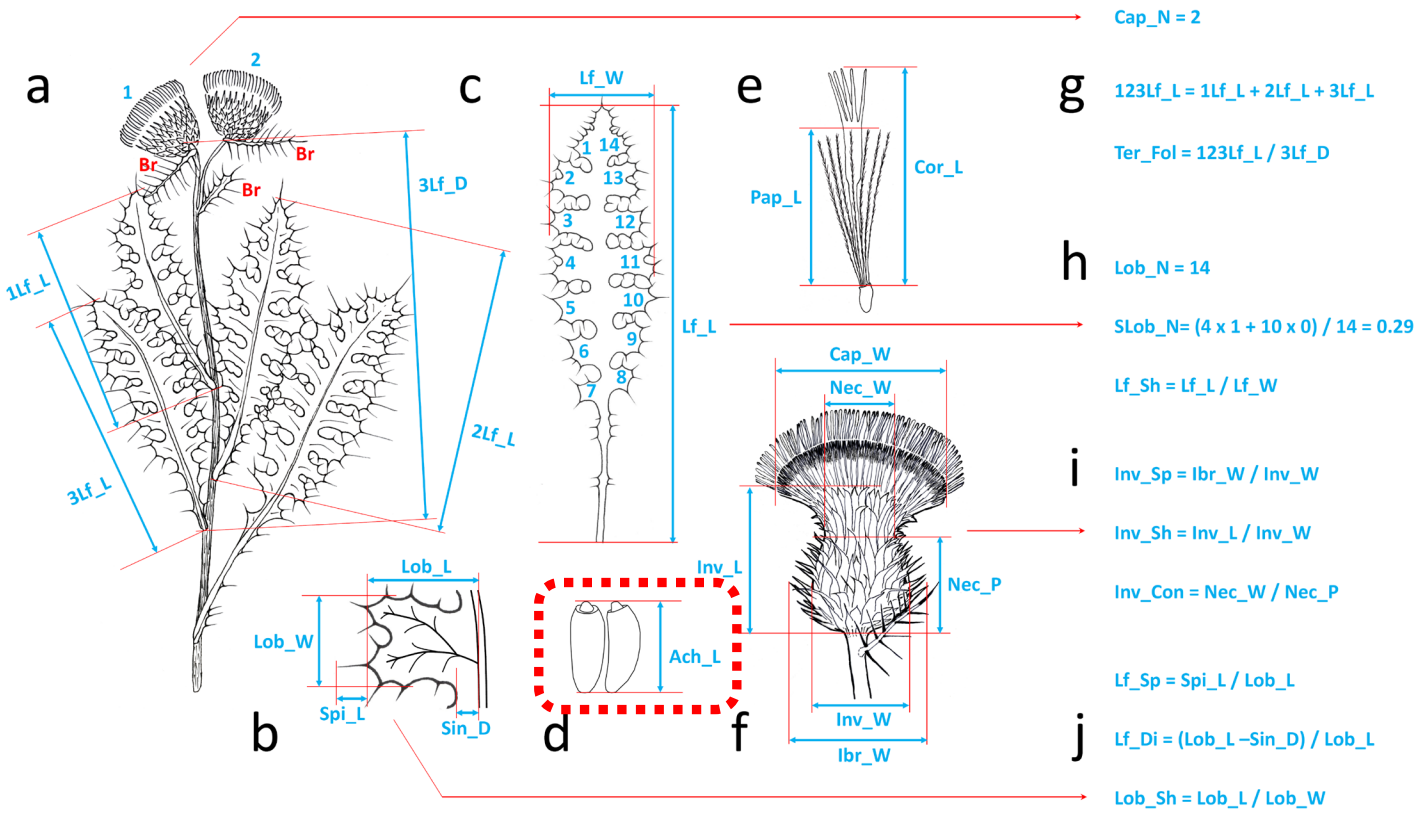
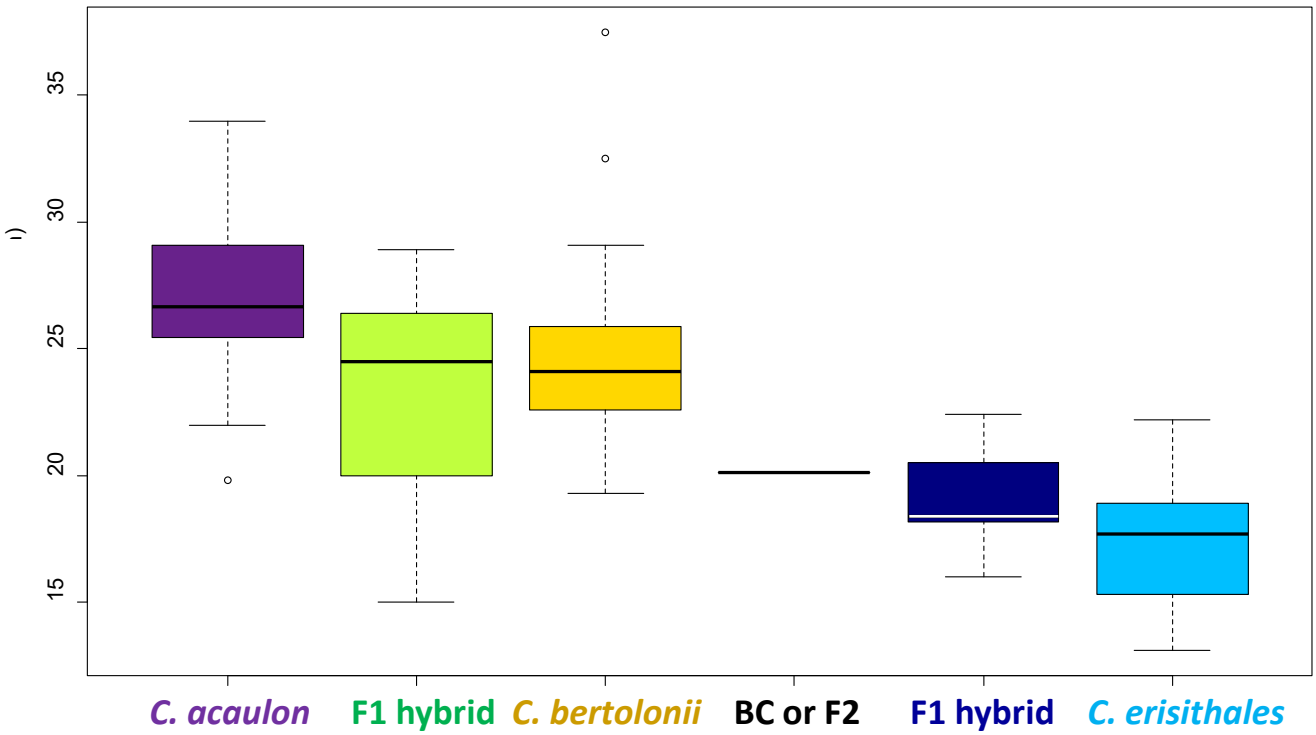
Online Resource 14.
Variability in morphological characters (**a–z**) detected in *Cirsium acaulon* × *C. bertolonii* and *C. bertolonii* × *C. erisithales* hybrids and parental species *C. acaulon*, *C. bertolonii*, and *C. erisithales*. Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles); **a** = achene length with respect to the taxa and sex (females and hermaphrodites); **b** = involucre length; **c** = involucre width; **d** = involucre width incl. bract tips; **e** = capitulum width; **f** = neck position; **g** = neck width; **h** = number of capitula; **i** = distance from capitulum to 3rd leaf; **j** = sum of lengths of uppermost three stem leaves; **k** = leaf length; **l** = leaf width; **m** = number of lateral lobes; **n** = number of secondary lobes; **o** = longest lateral lobe length; **p** = longest lateral lobe width; **q** = length of terminal spine of the longest lateral lobe; **r** = sinus depth of the longest lateral lobe; **s** = involucre spinosisty; **t** = involucre shape; **u** = involucre constriction; **v** = terminal foliage; **w** = leaf shape; **x** = leaf spinosisty; **y** = leaf division; **z** = leaf lobe shape. For more details on how the characters were measured, see Fig. 1.



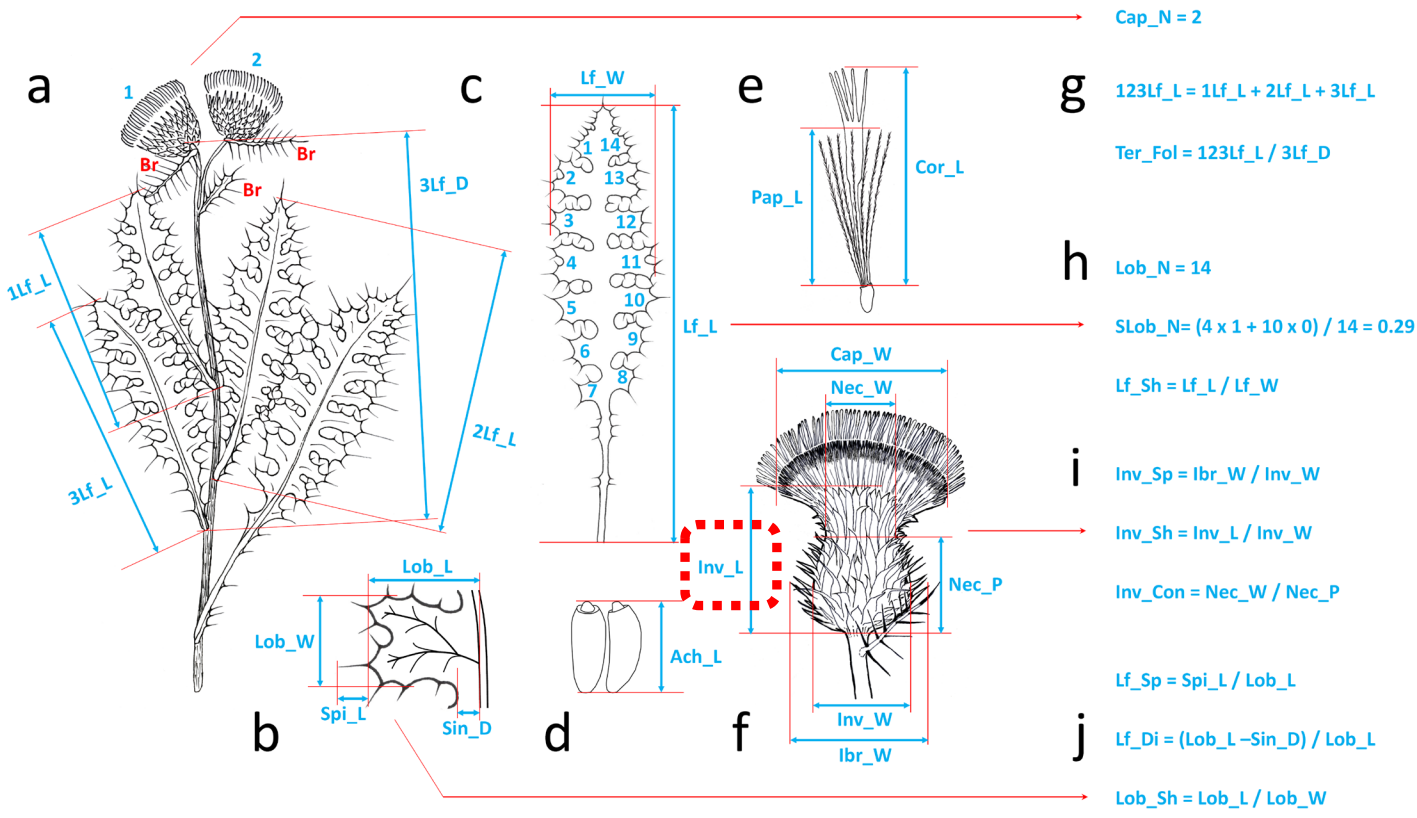
OR. 14a. Measured on achenes taken out from terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles); fem = female plants; herm. = hermaphrodite plants.



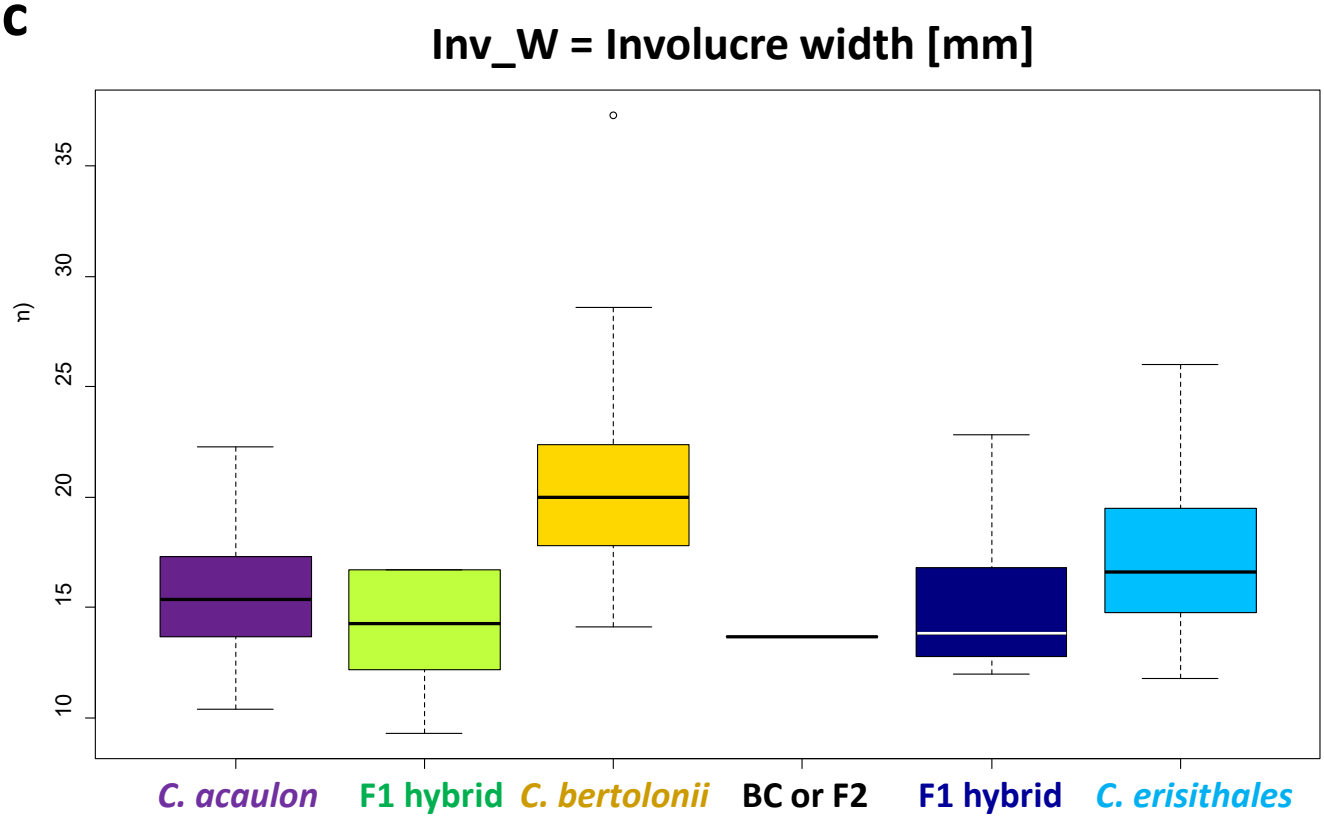
b



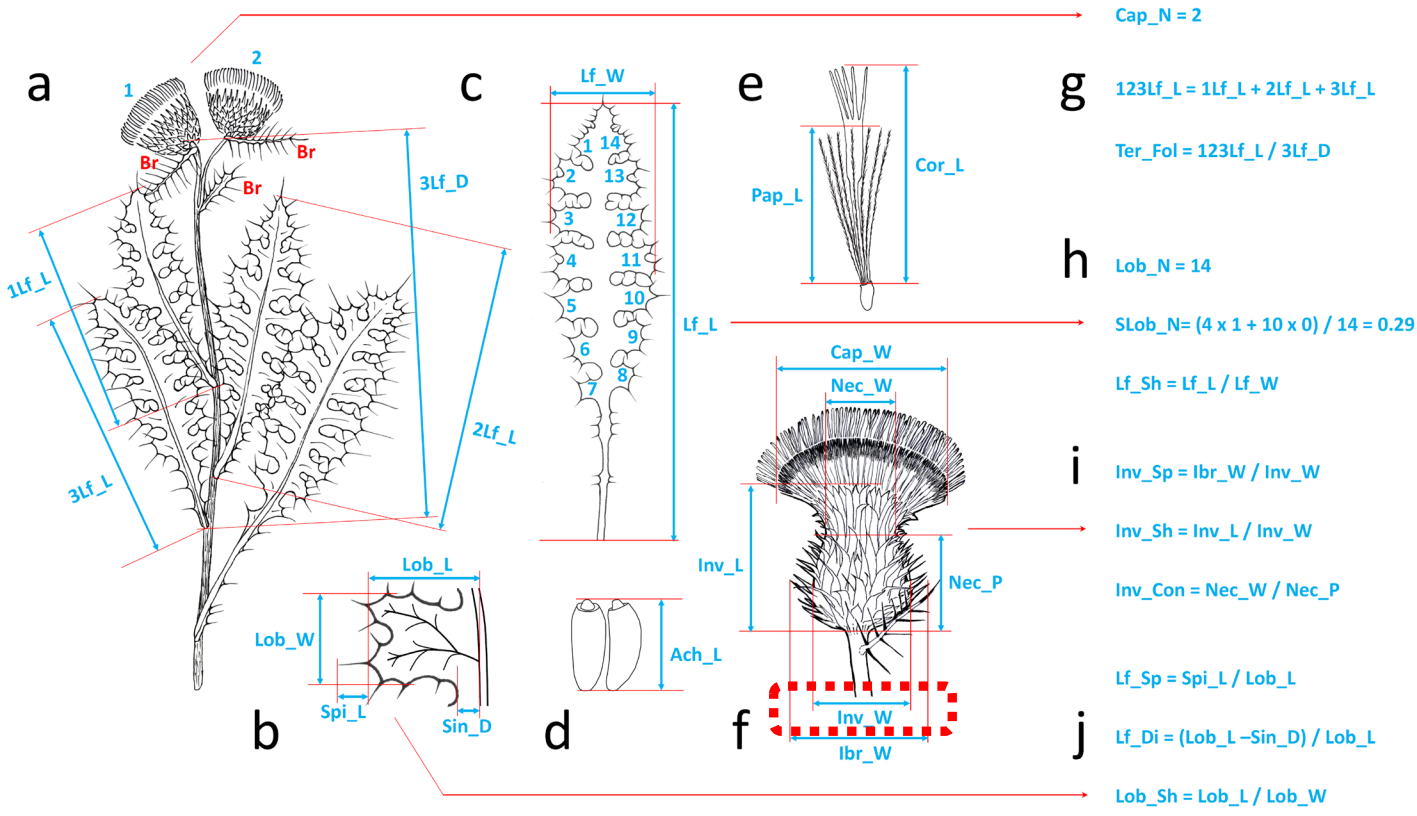
OR. 14b. Measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



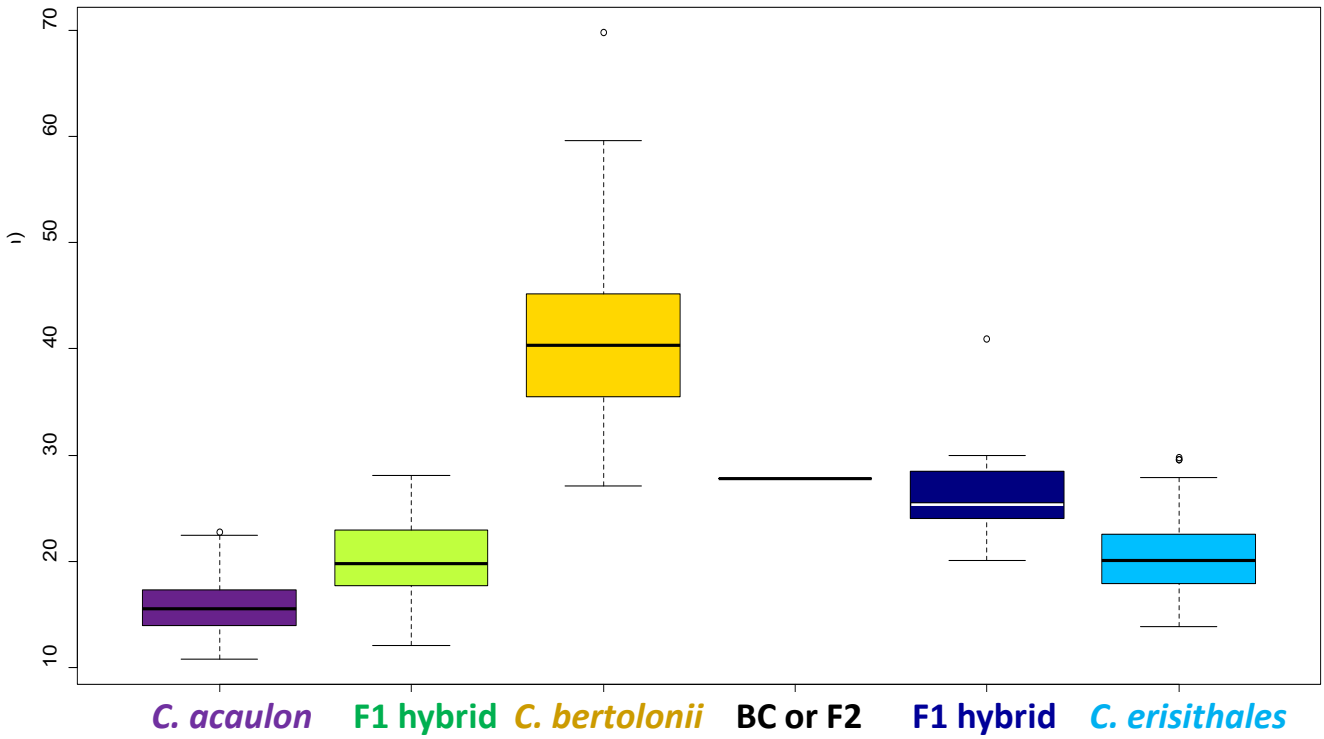
c



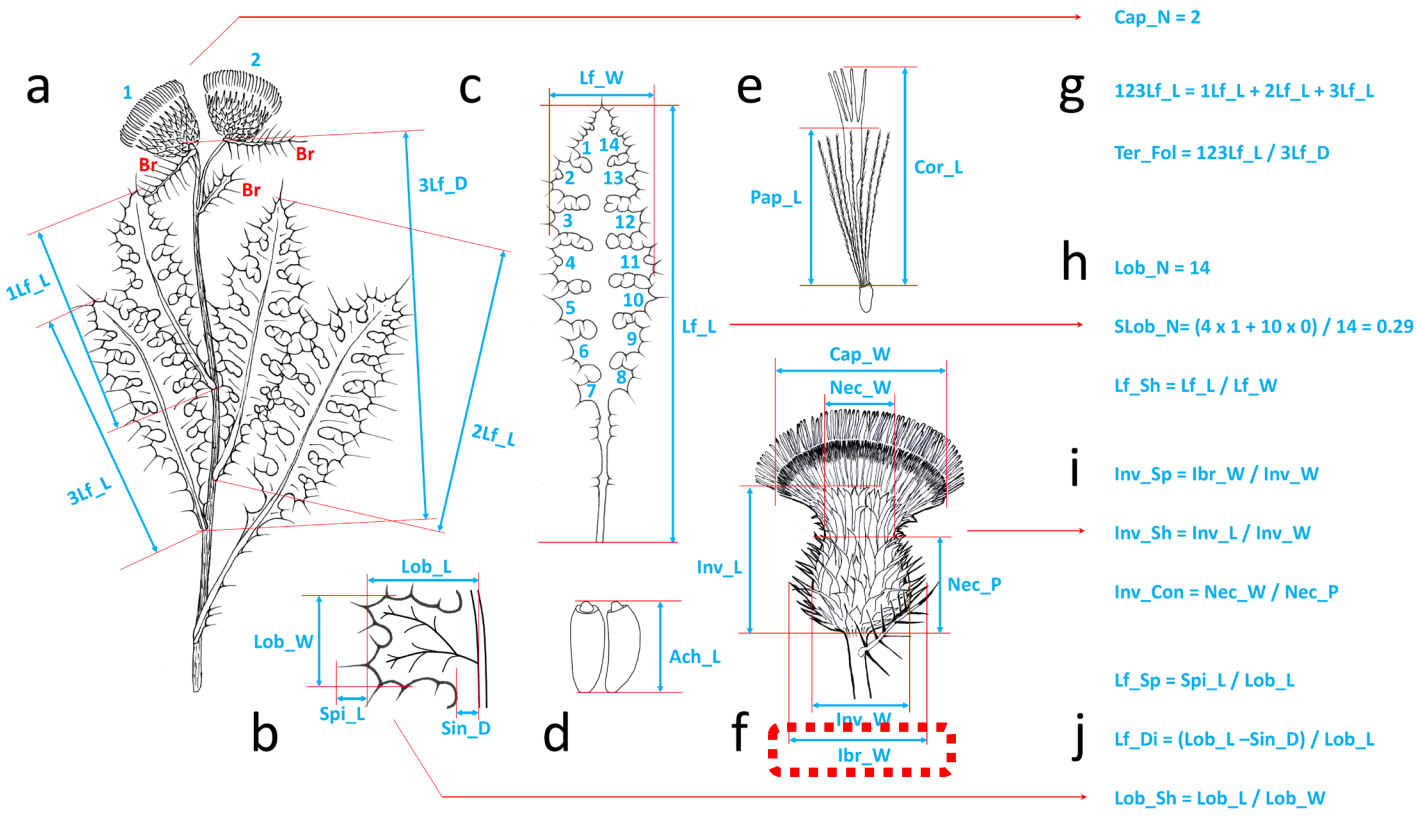
OR. 14c. Measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



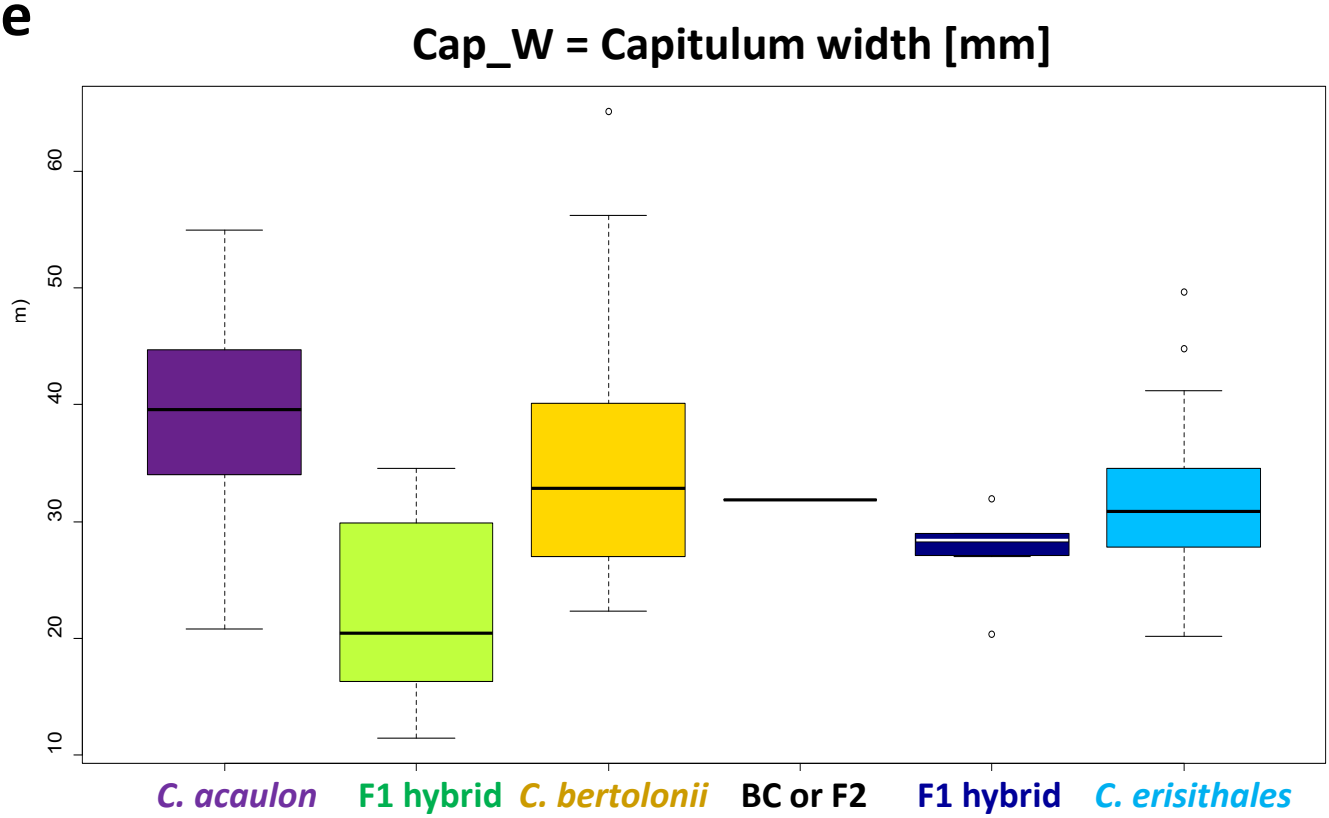
d



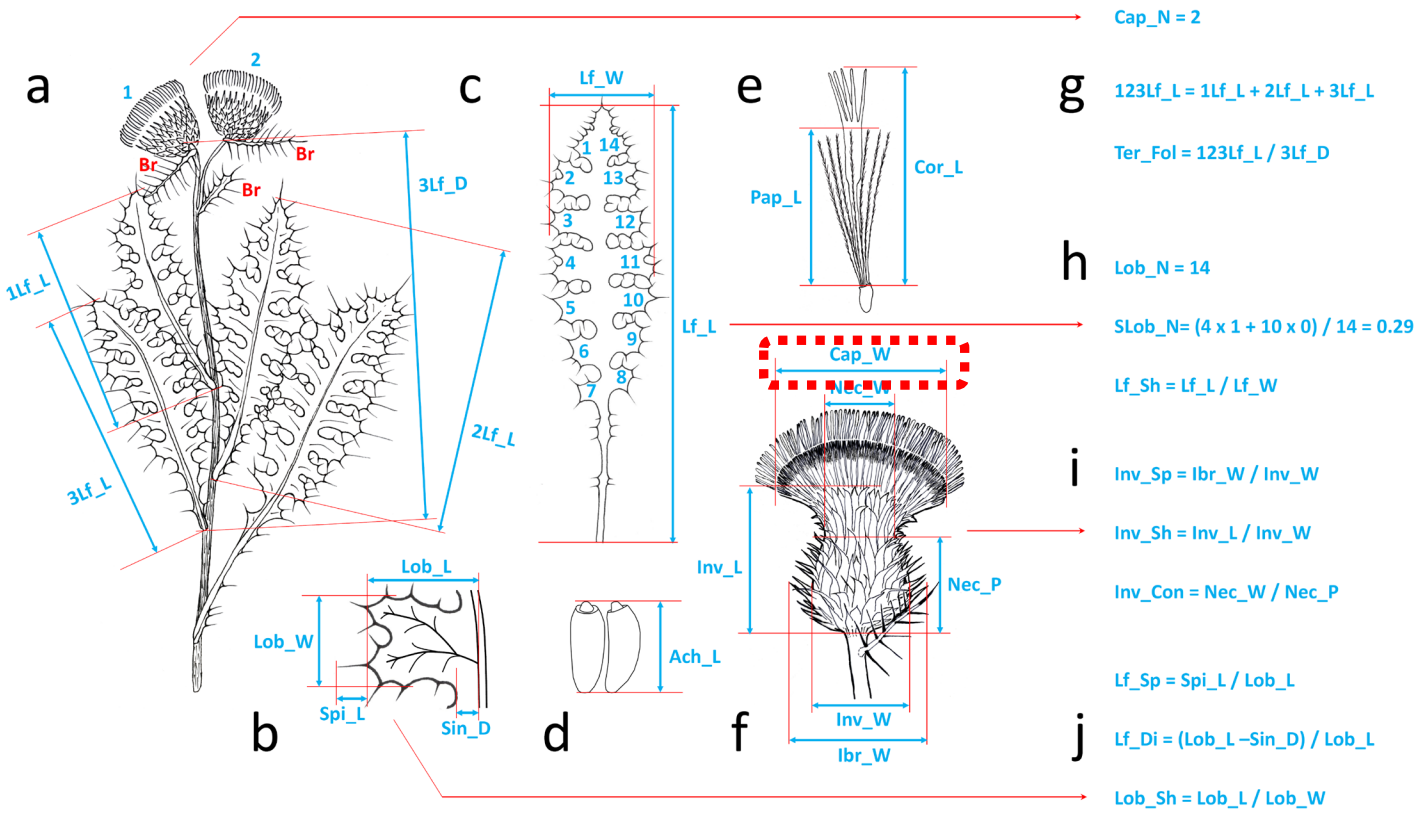
OR. 14d. Measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



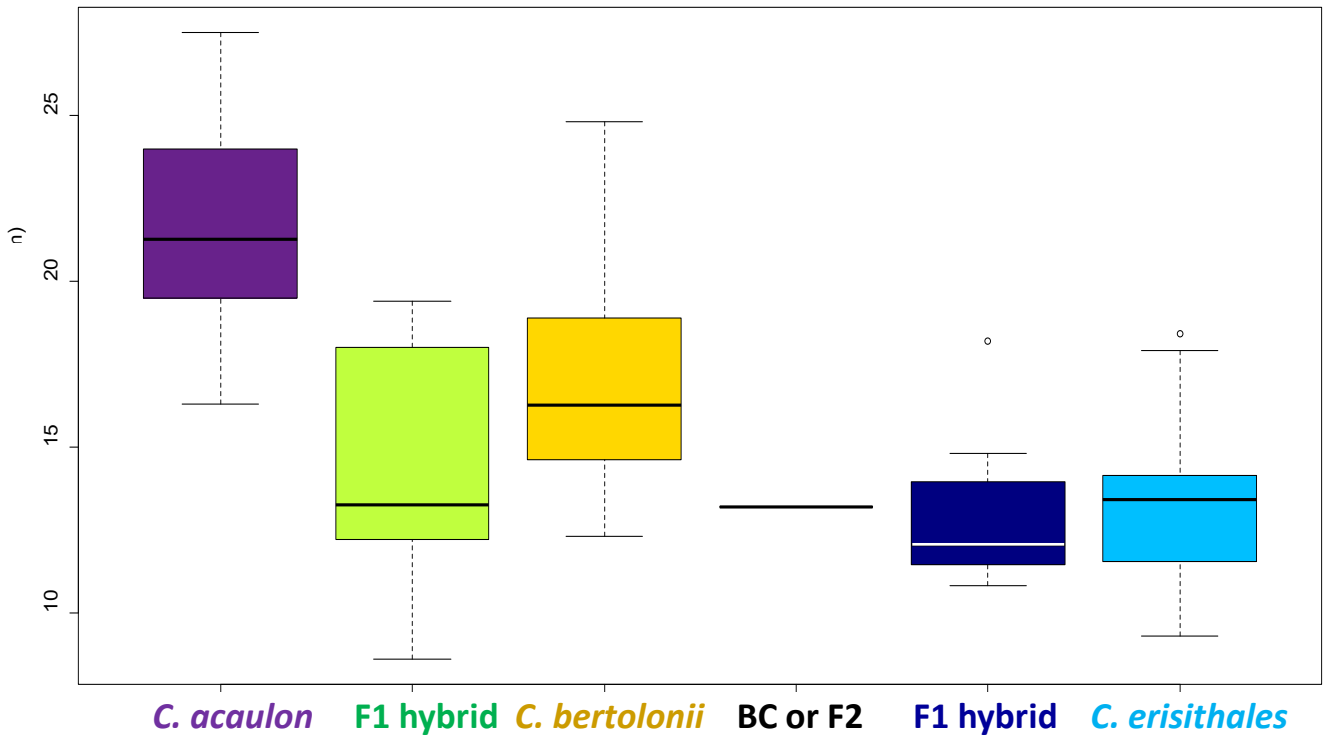
e



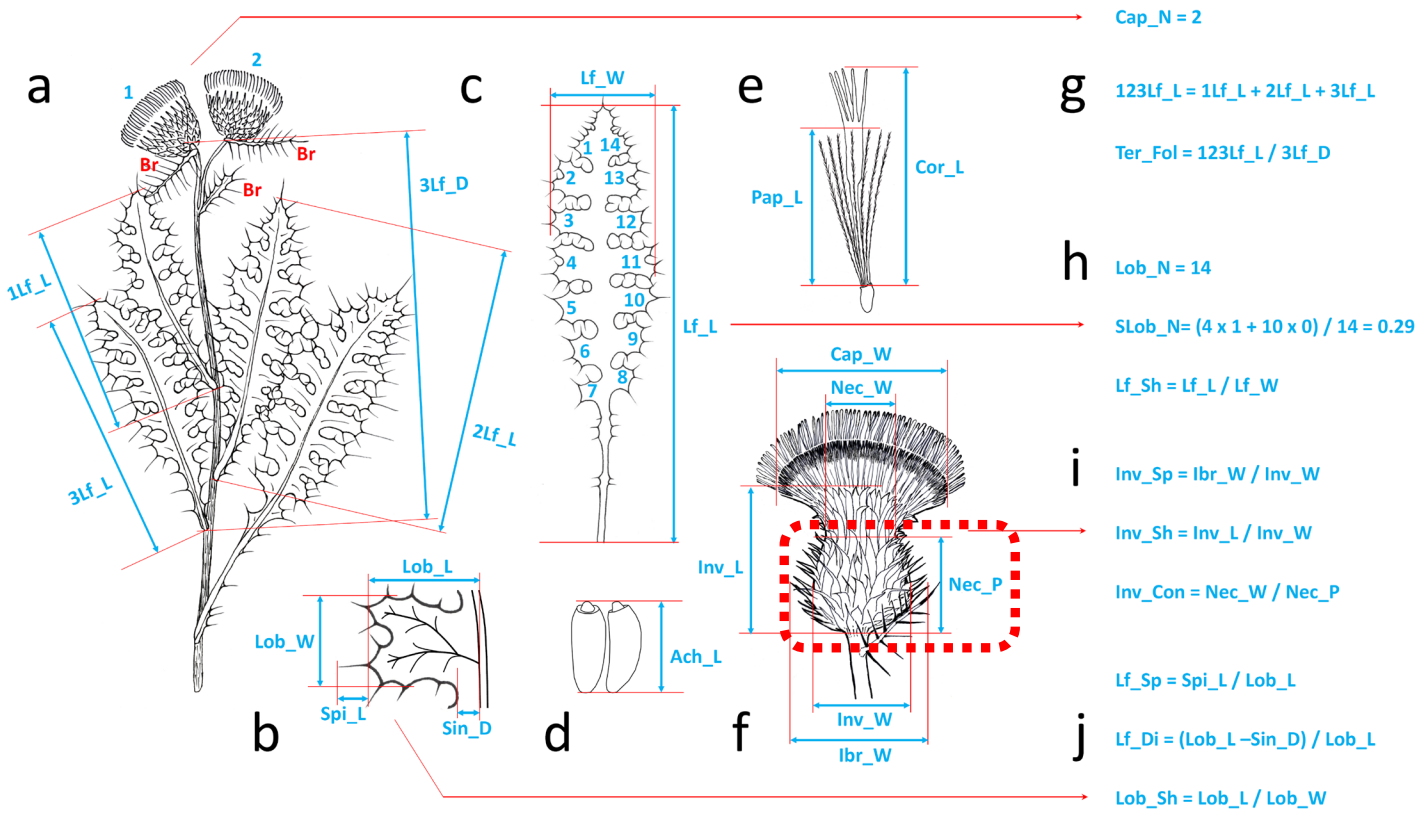
OR. 14e. Measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



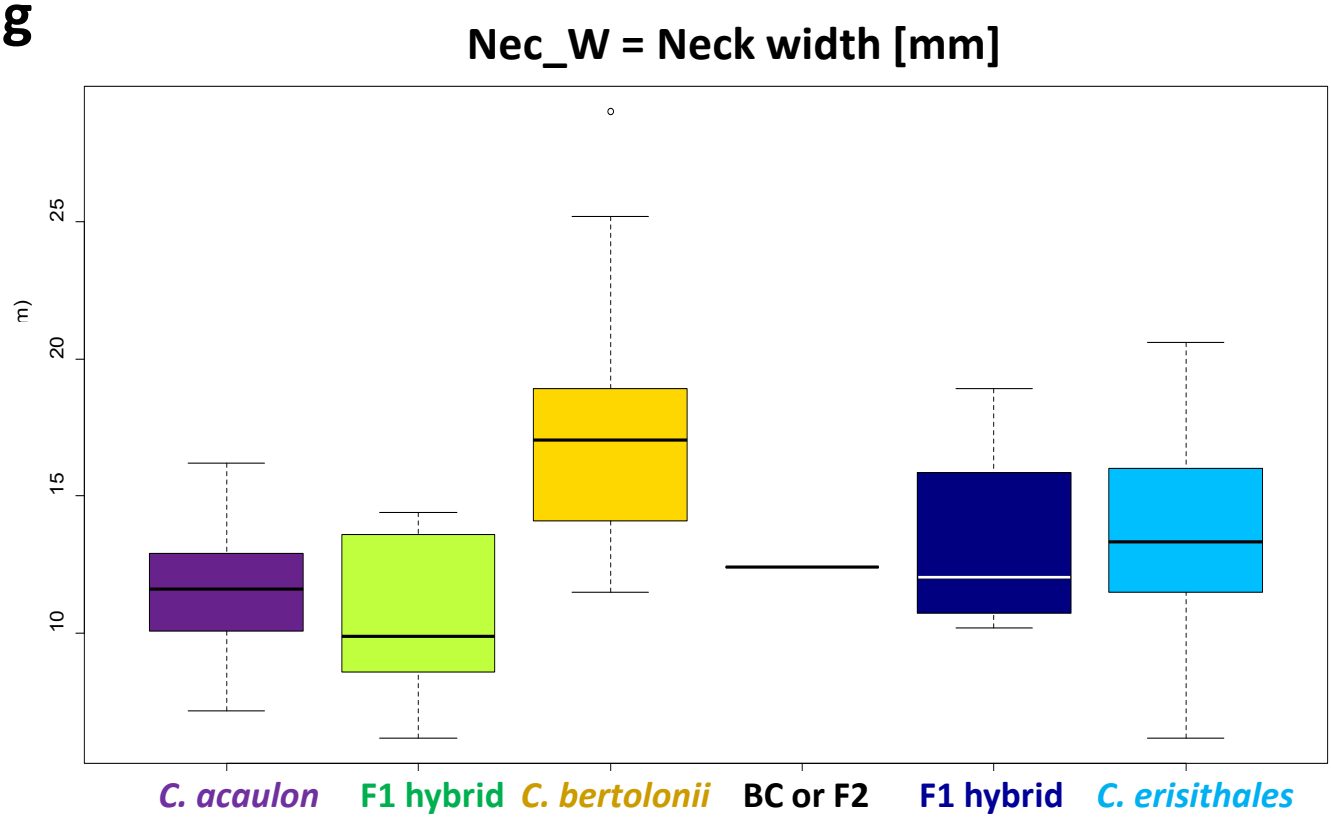
f



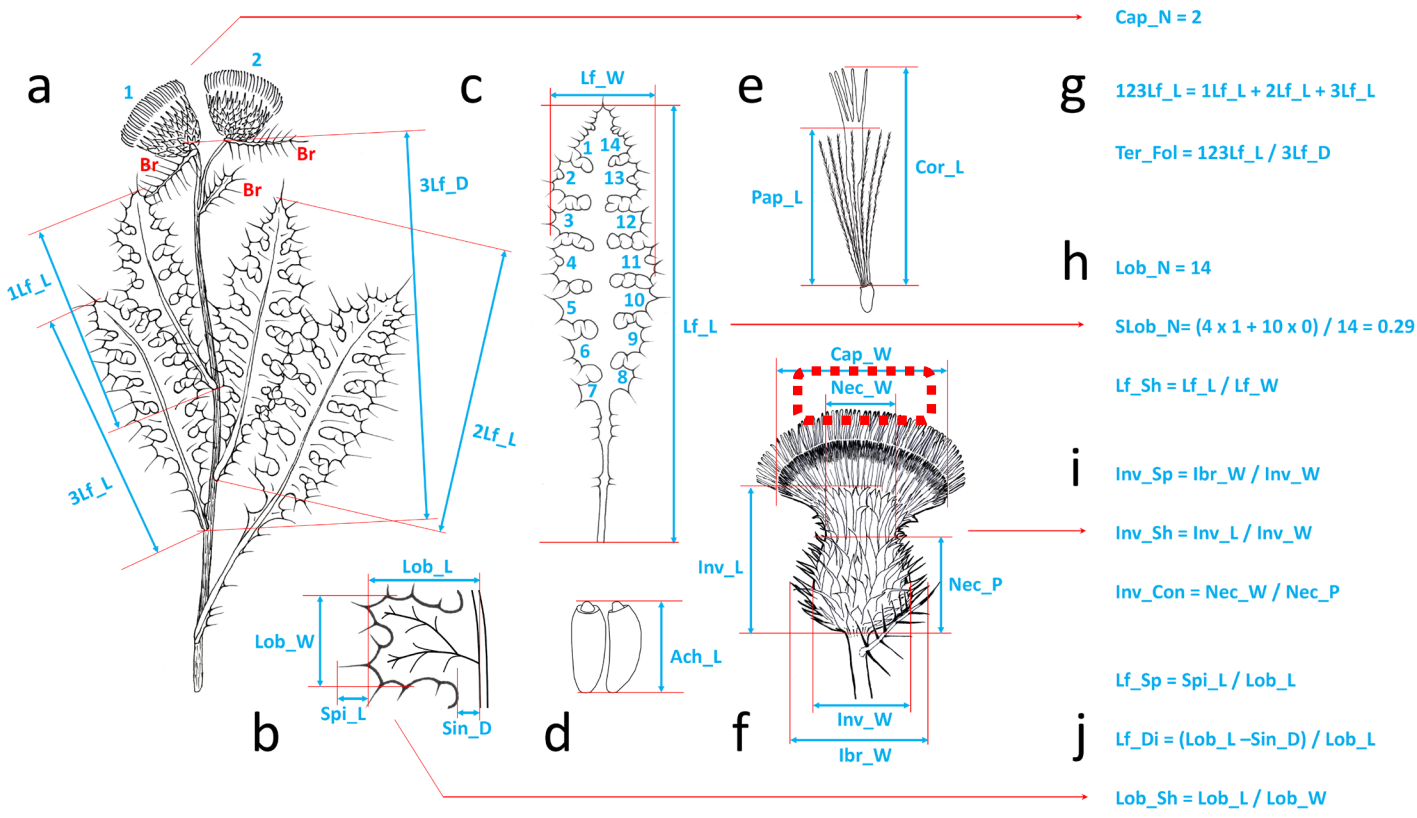
OR. 14f. Neck means constricted part of involucre – measured on fully flowering terminal capitulum (for more details see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



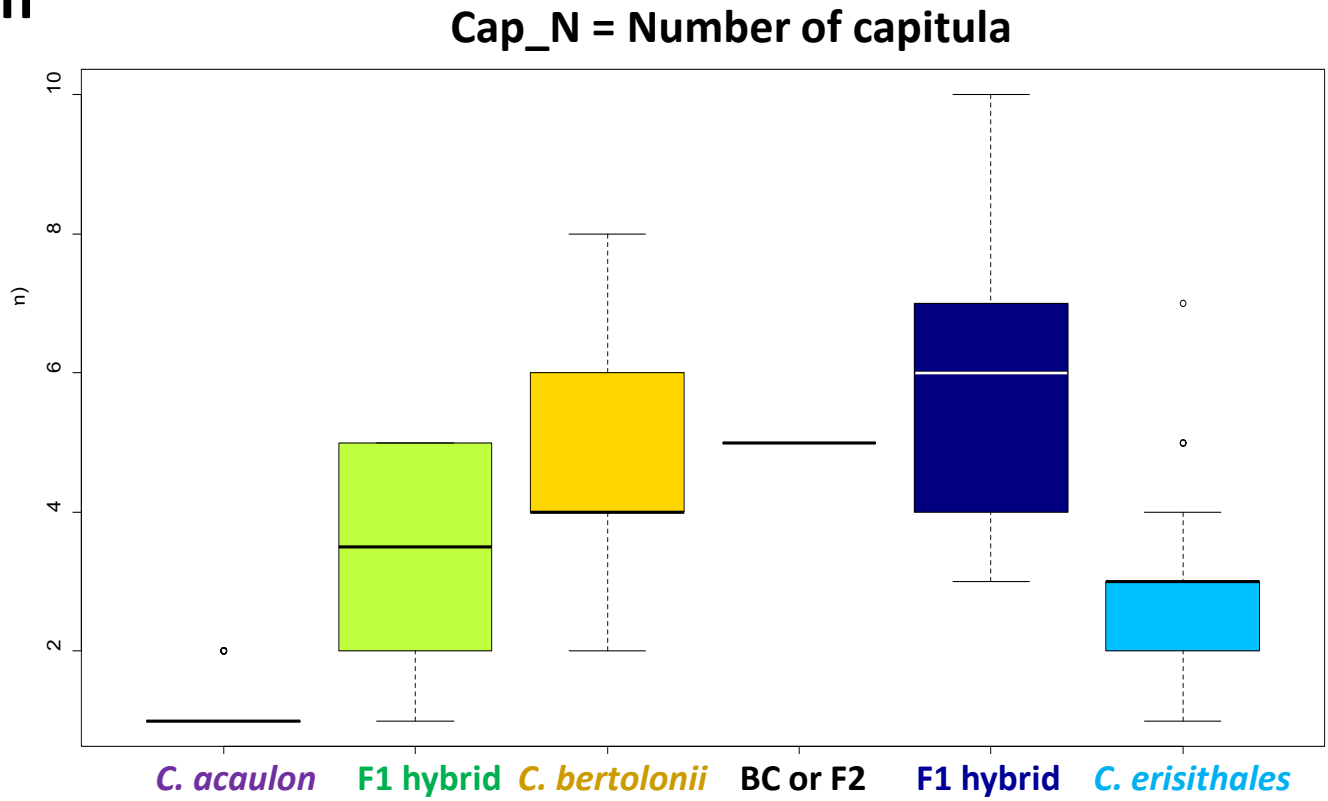
g



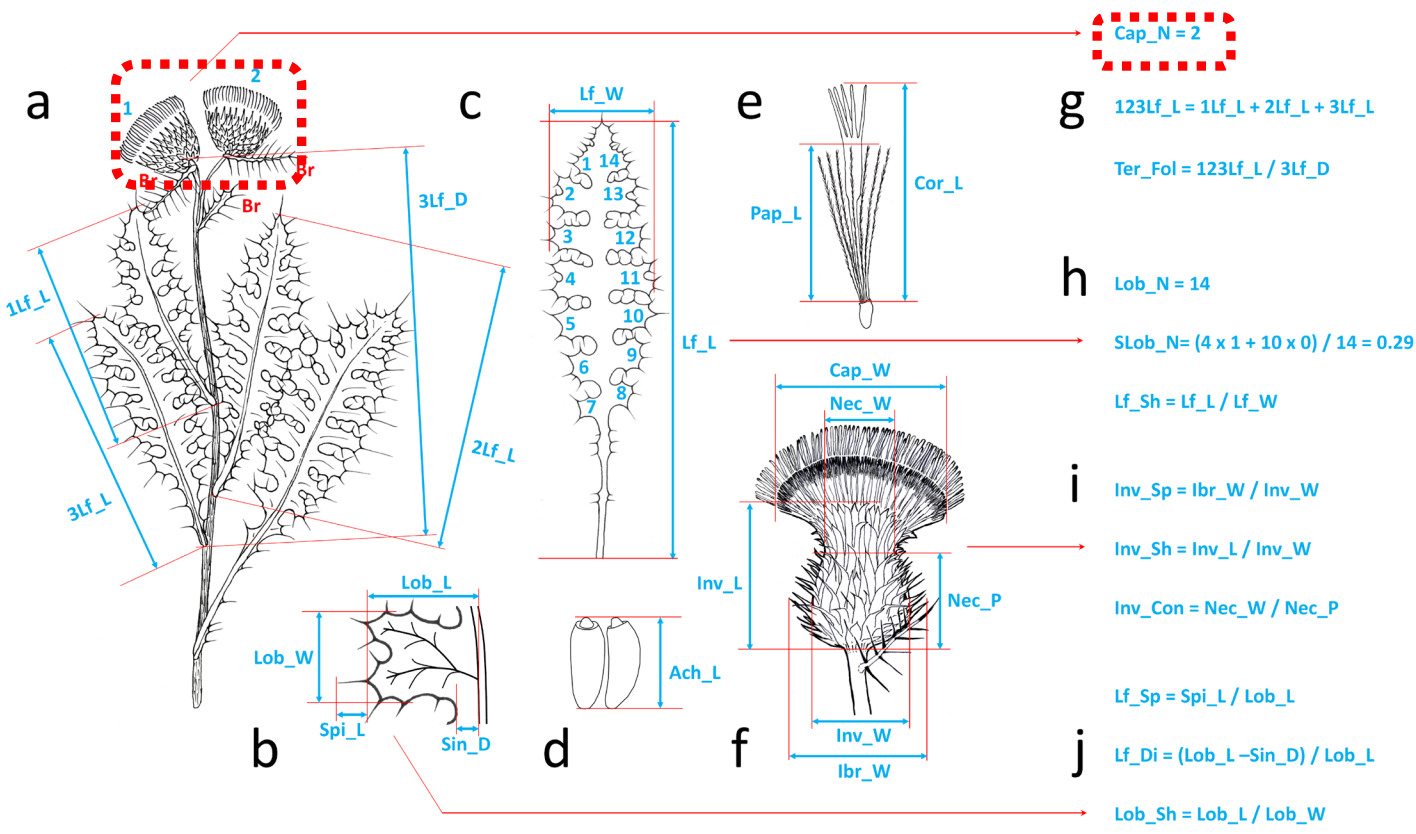
OR. 14g. Neck means constricted part of involucre – measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



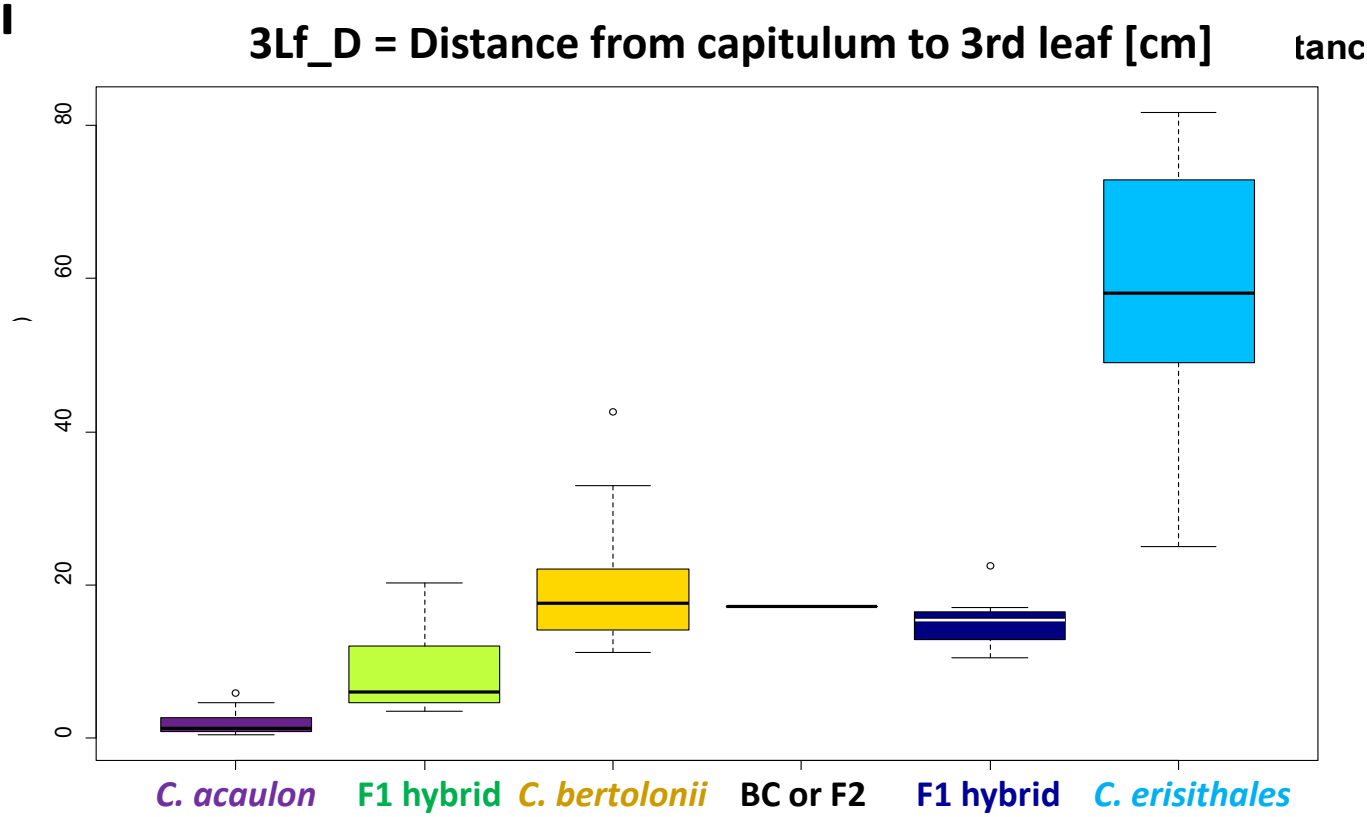
h



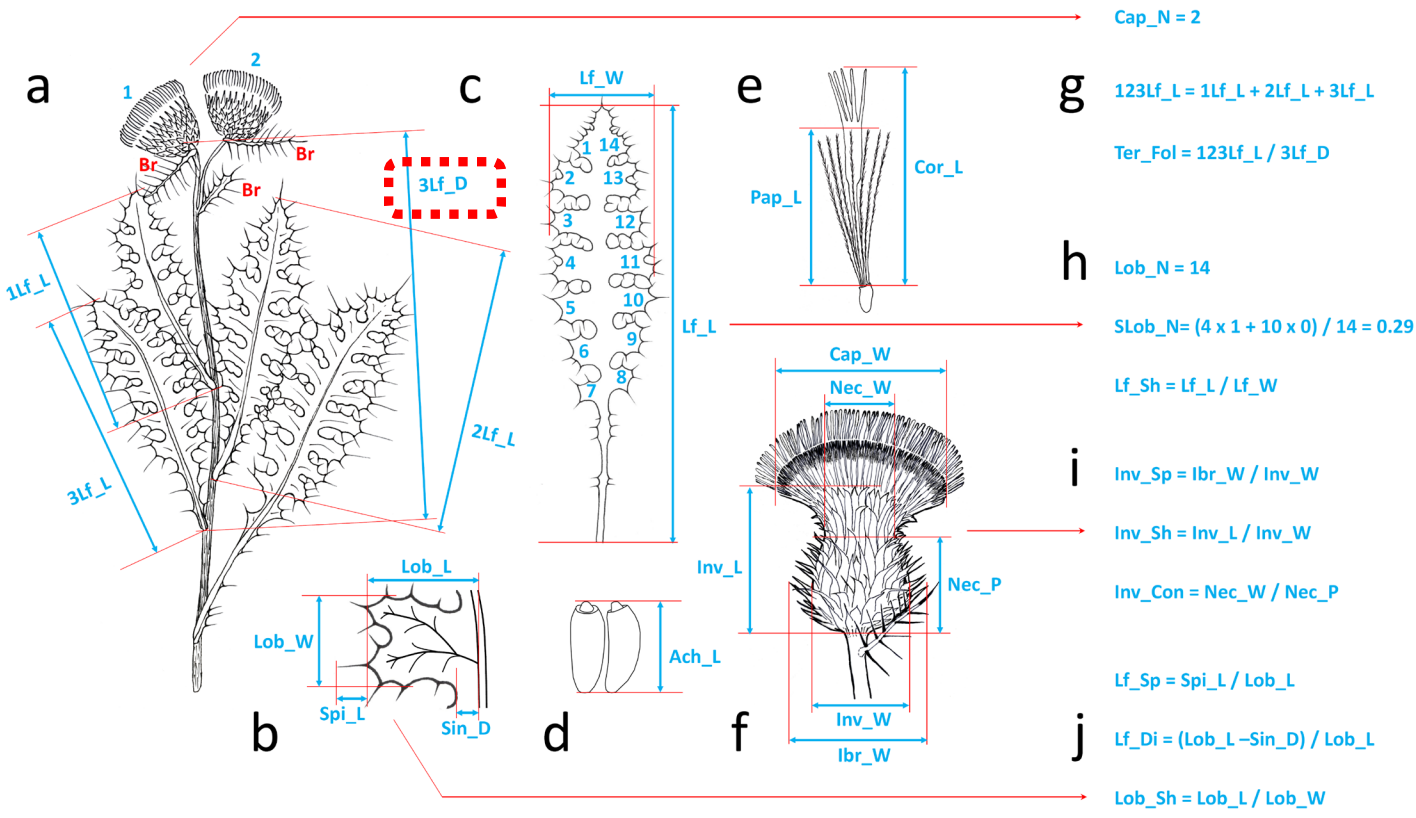
OR. 14h. Only well developed capitula were counted not dwarfed capitular buds (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



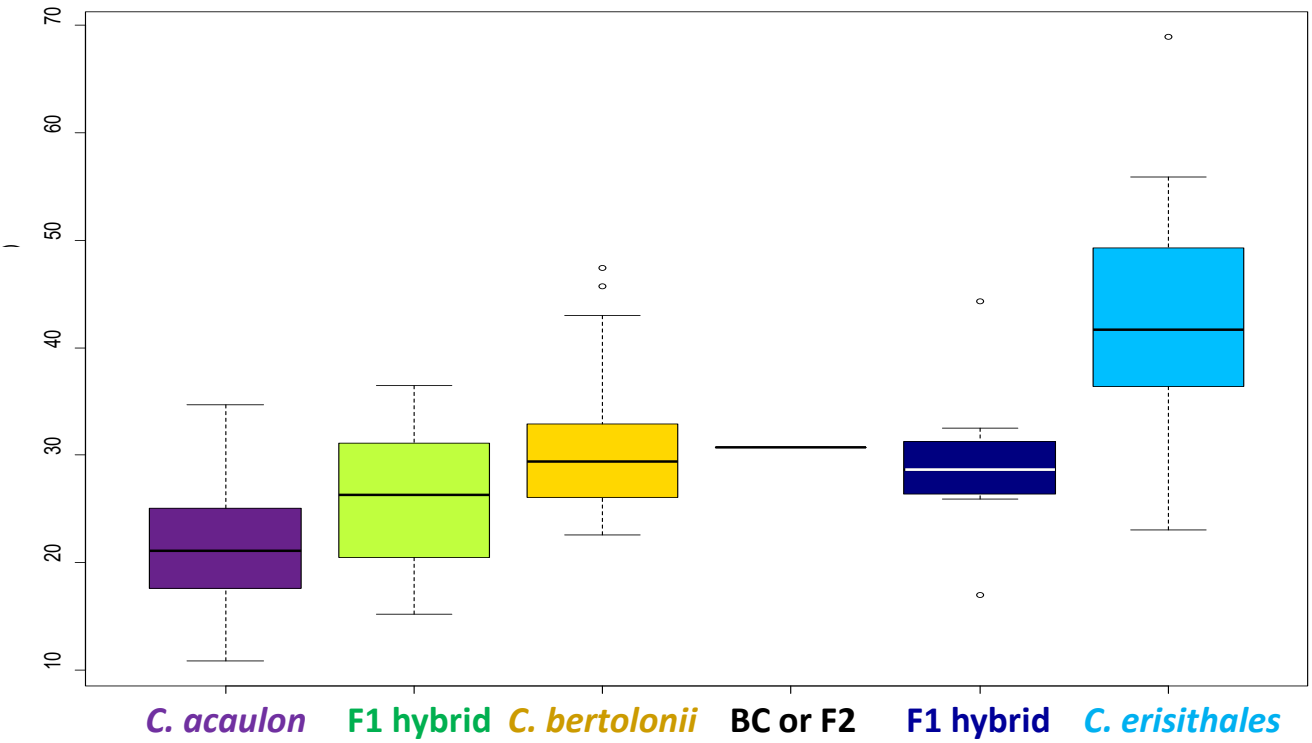
i



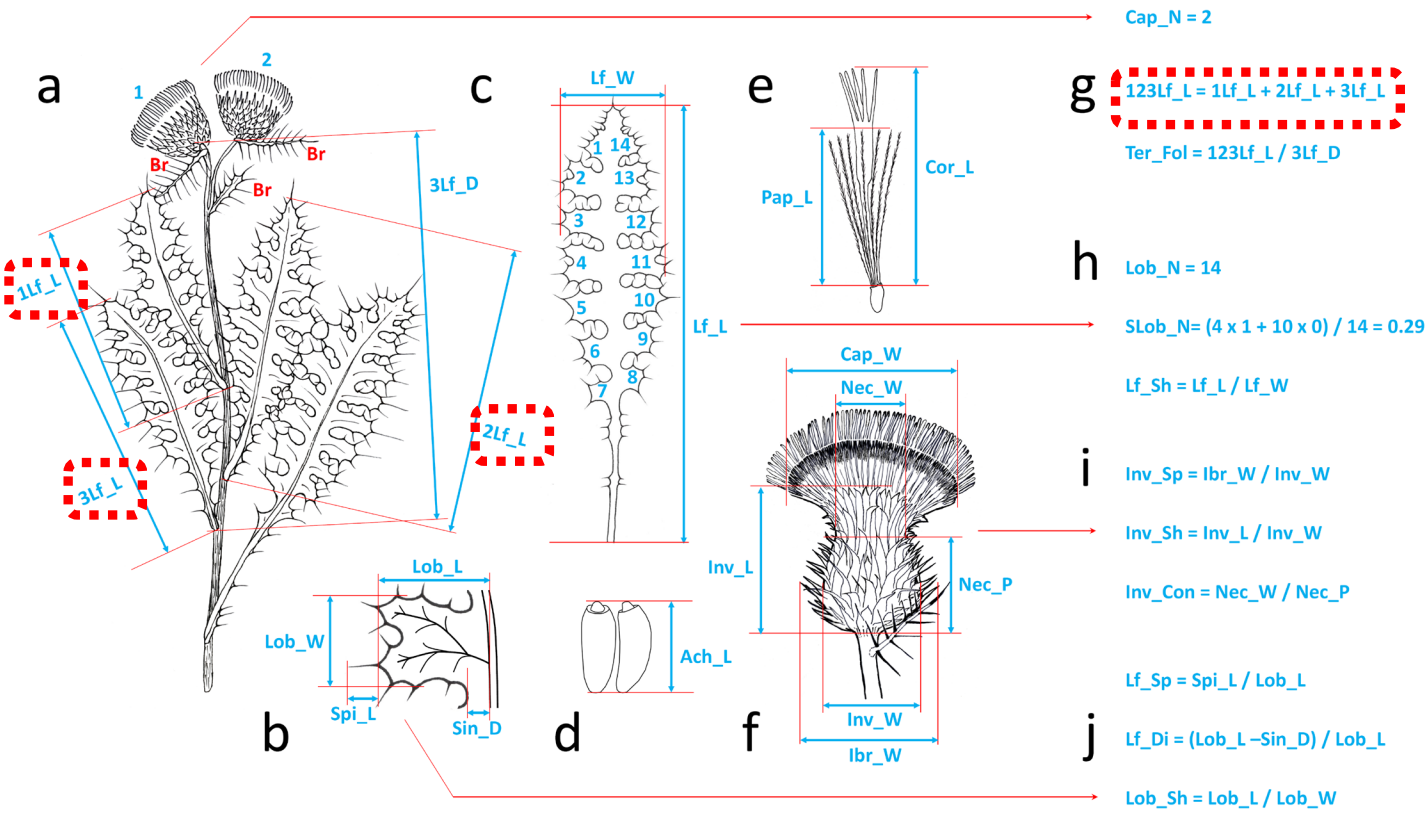
OR. 14i. Distance between base of terminal capitulum and 3rd leaf-stem connection, see **below** – only foliage leaves were measured not bracts (= modified leaves subtending capitulum or its peduncle usually more simple in division than leaves – Br on the figure **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



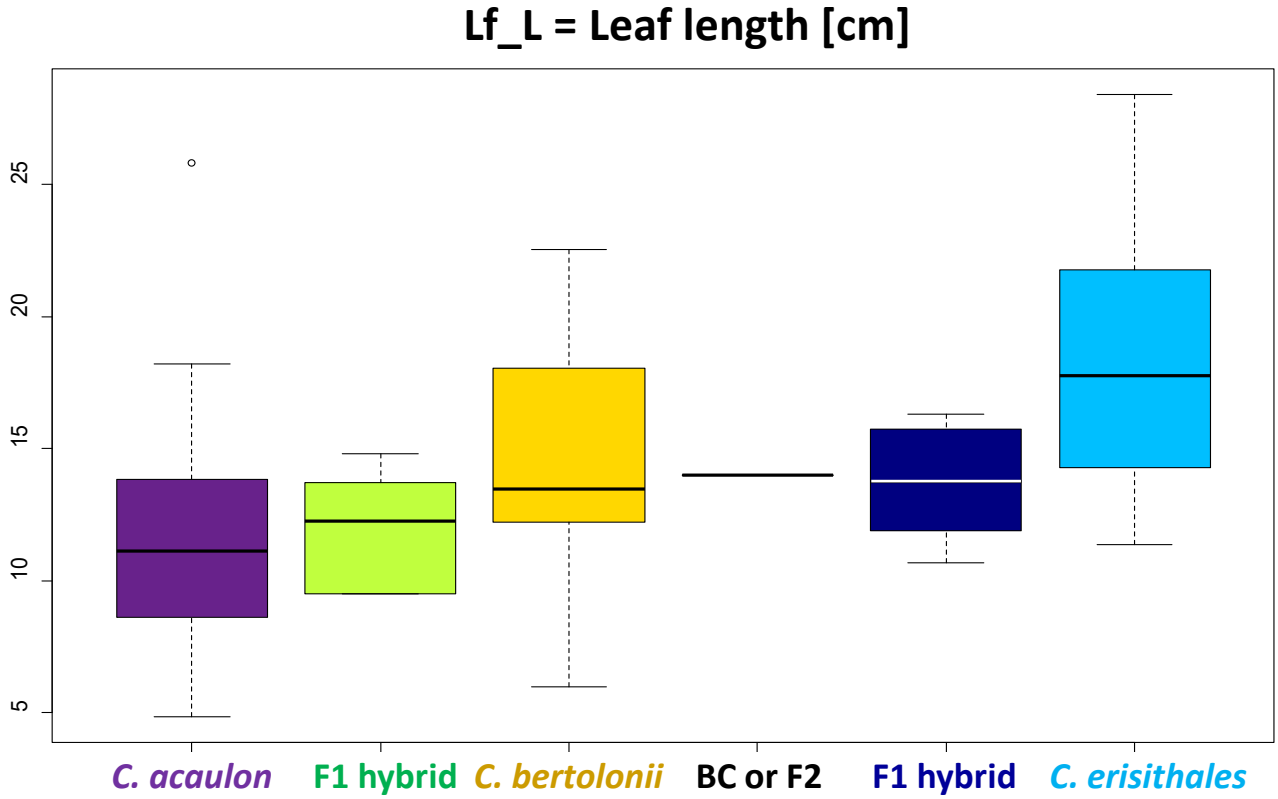
j



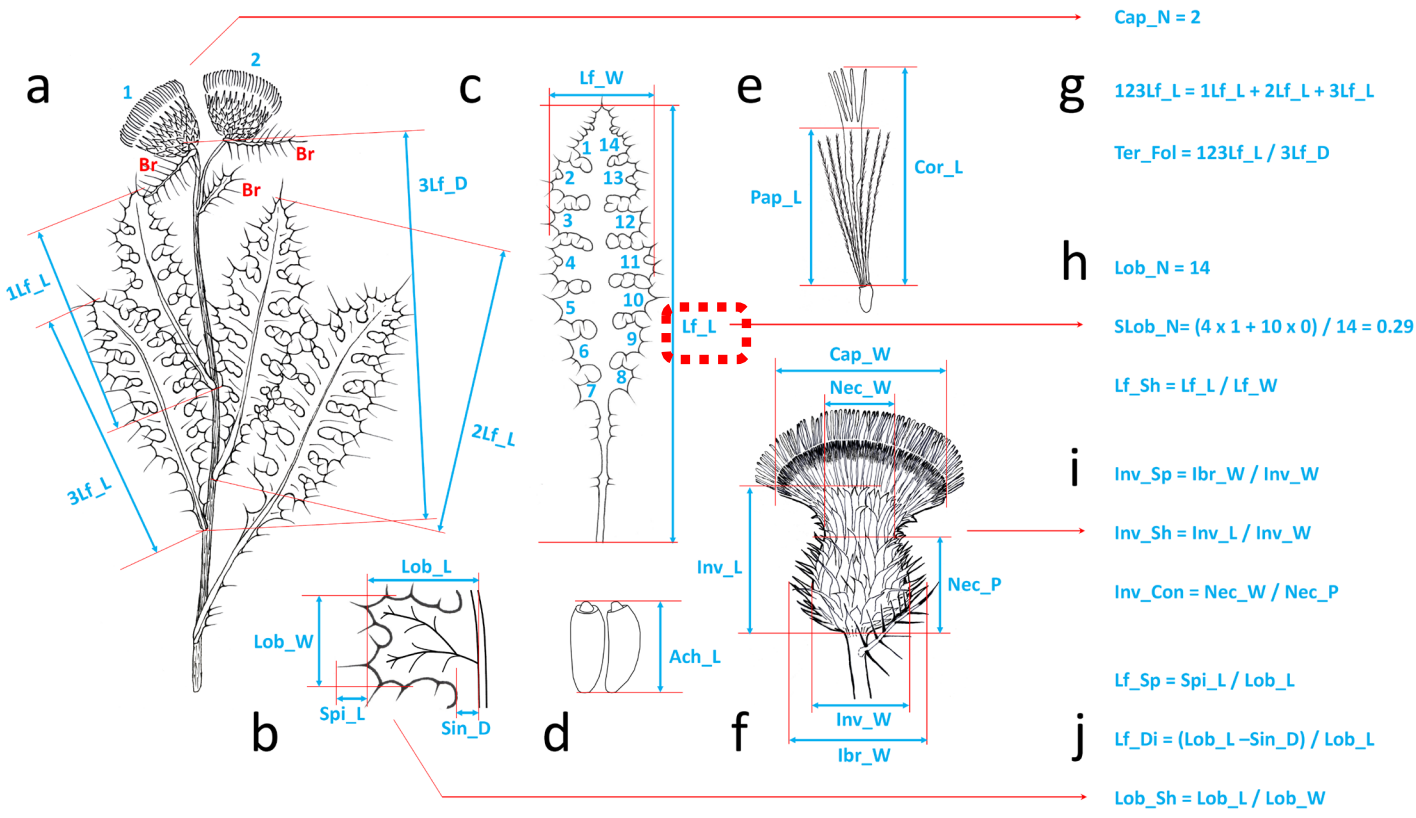
OR. 14j. Sum of lengths of uppermost three stem leaves, see **below** – only foliage leaves were measured not bracts (= modified leaves subtending capitulum or its peduncle usually more simple in division than leaves – Br on the figure **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



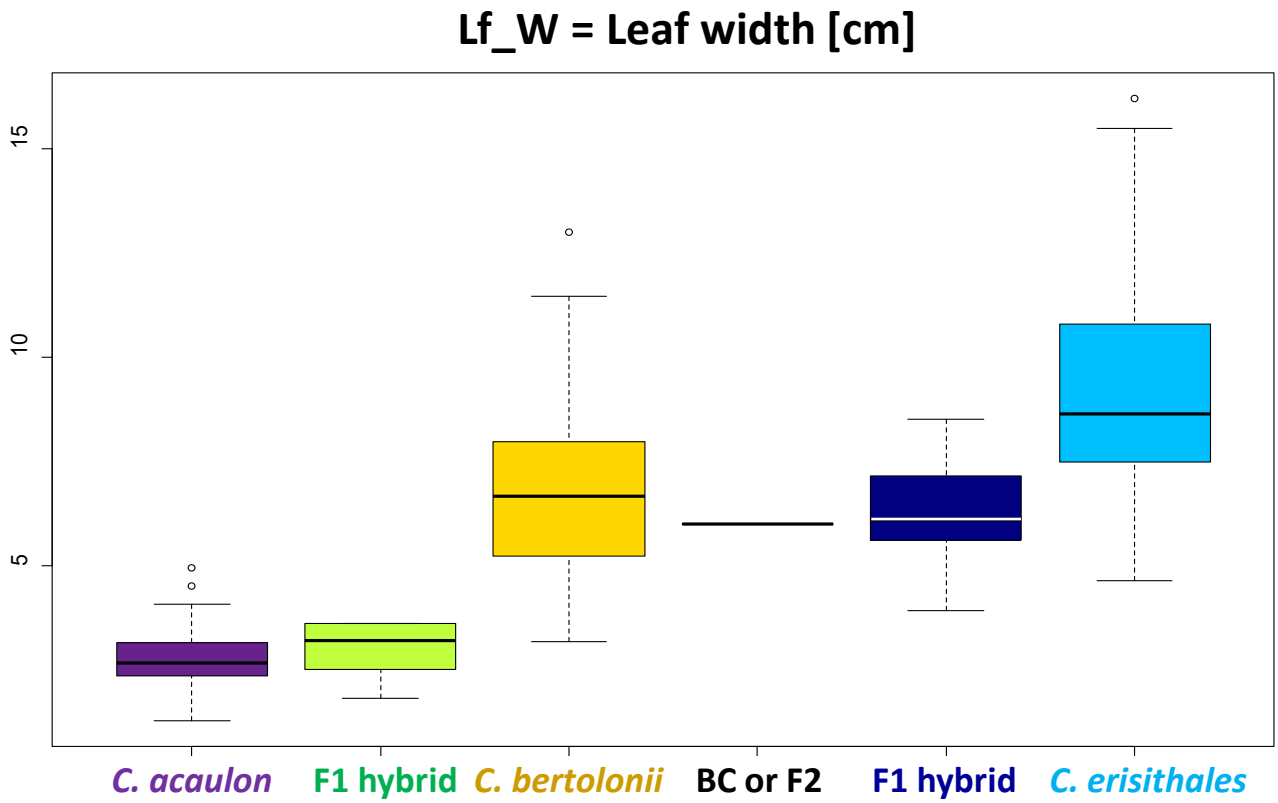
k



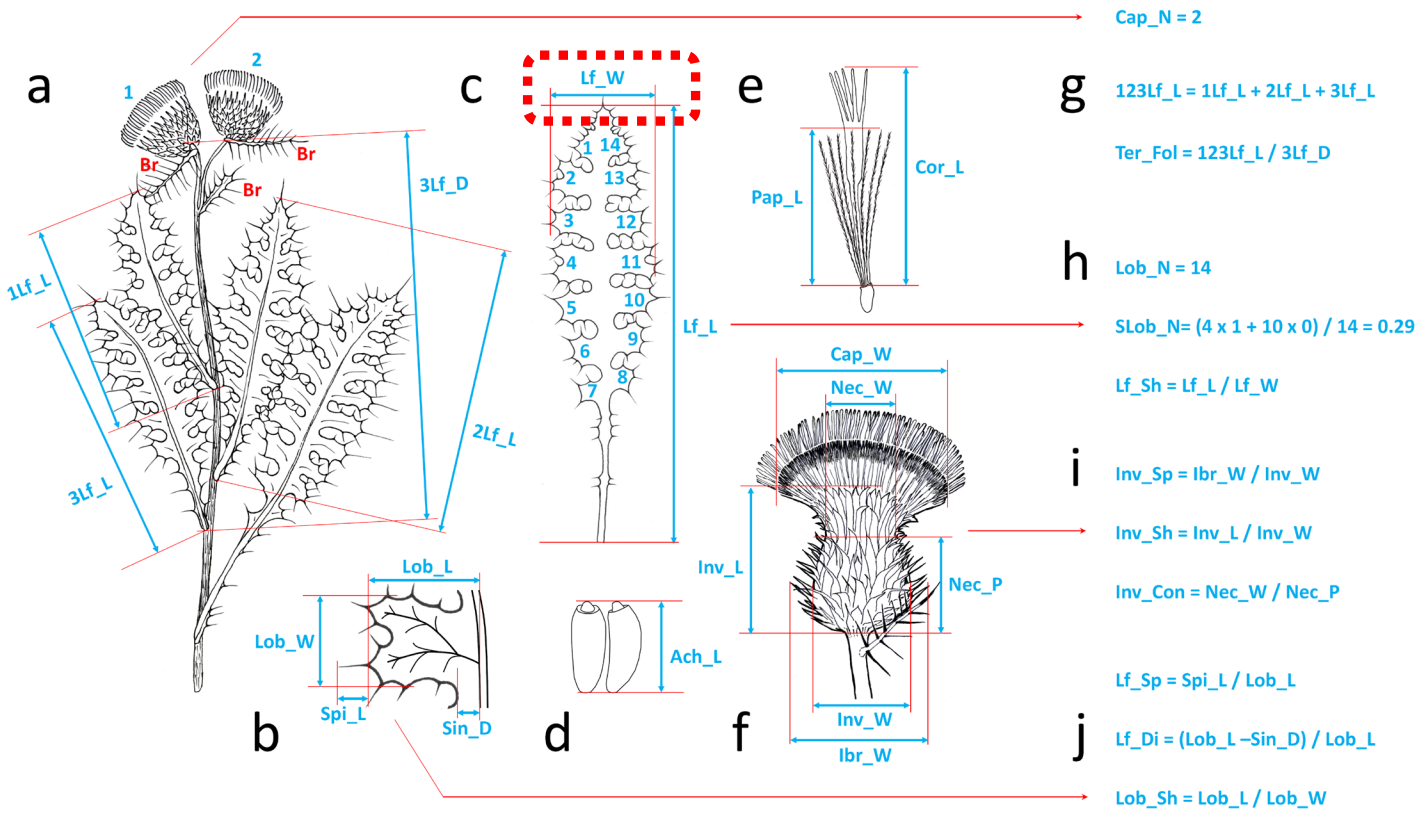
OR. 14k. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



l



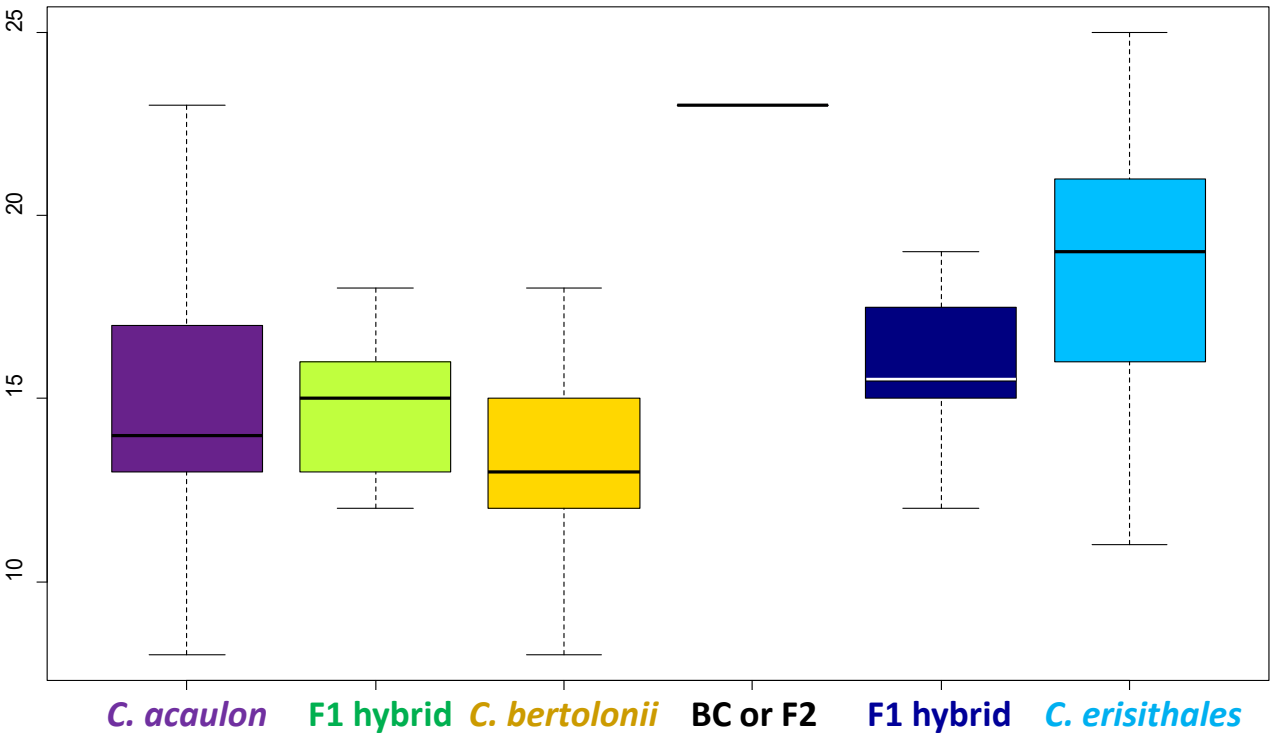
OR. 14l. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



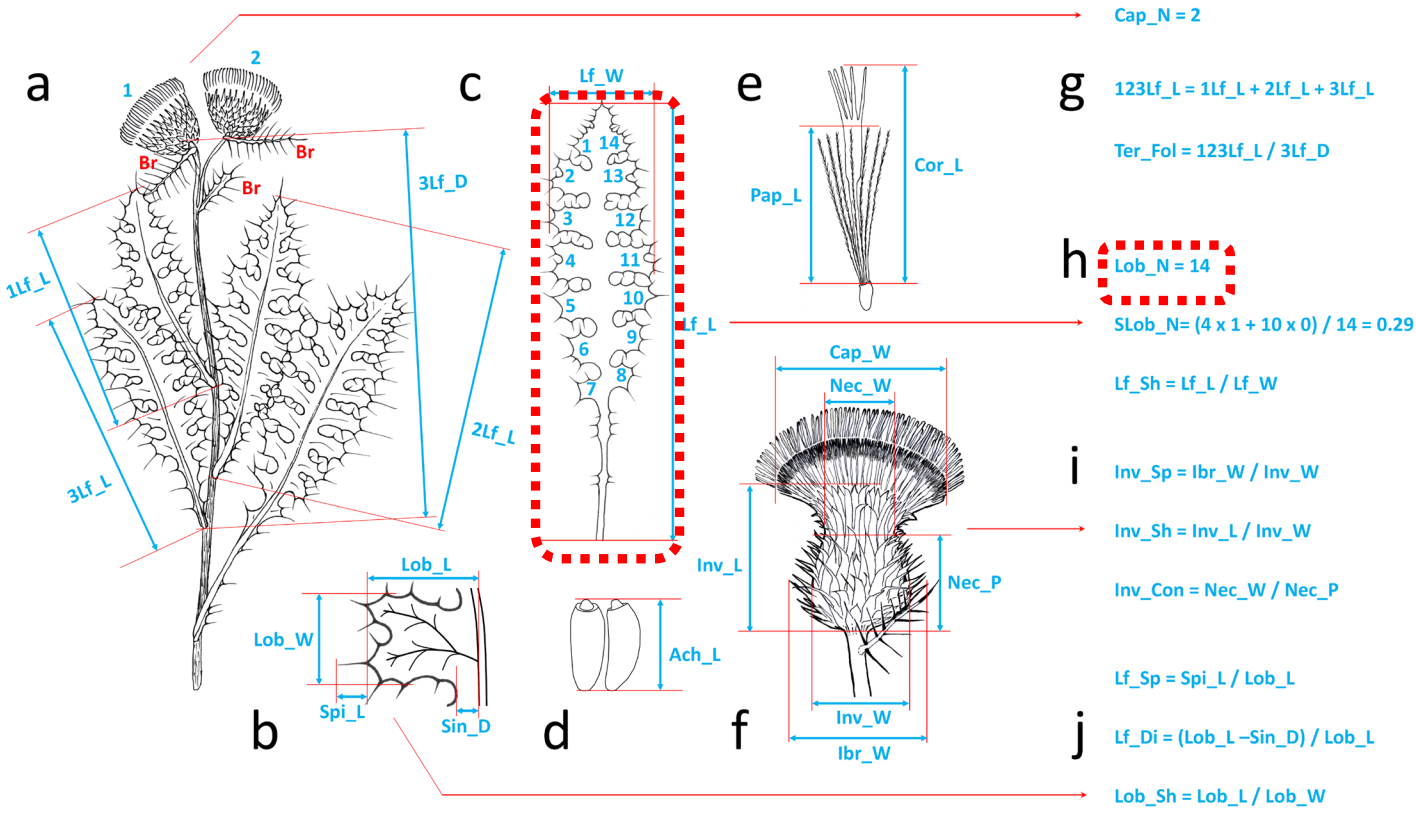
m

Lob_N = Number of lateral lobes

leaf

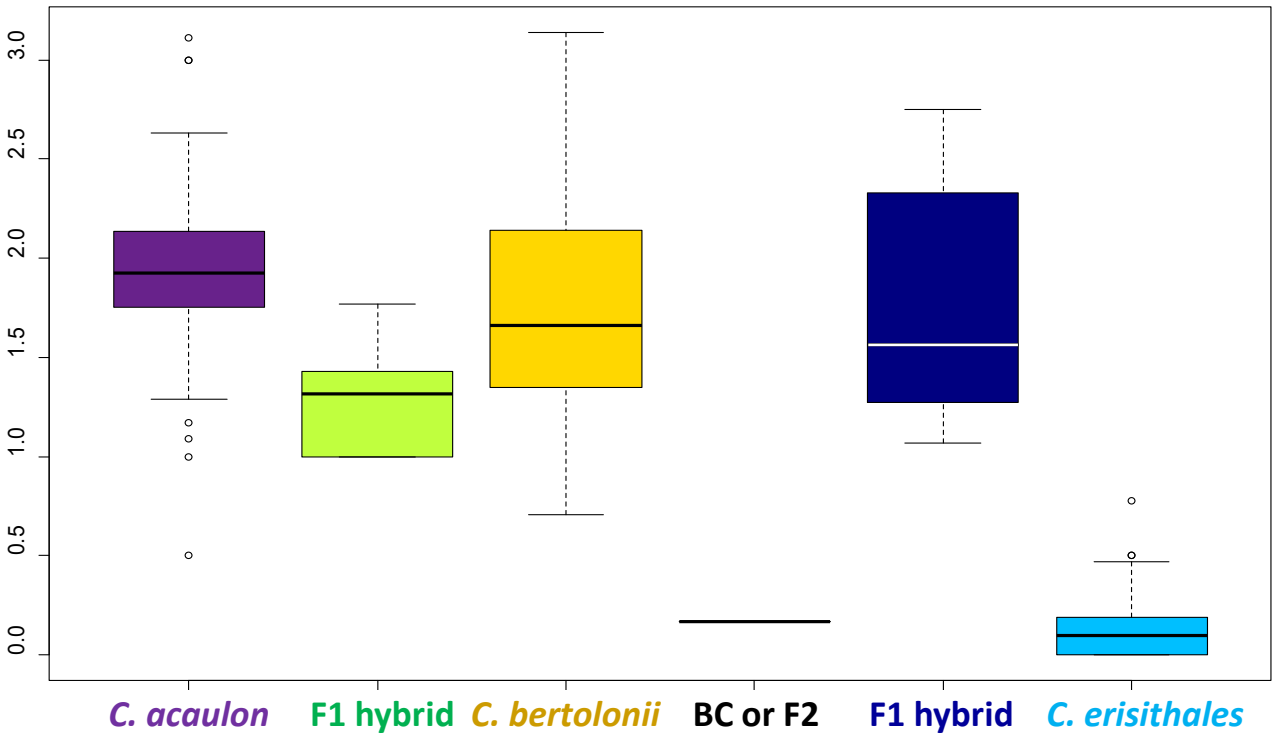


OR. 14m. Estimated on lateral lobes of well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).

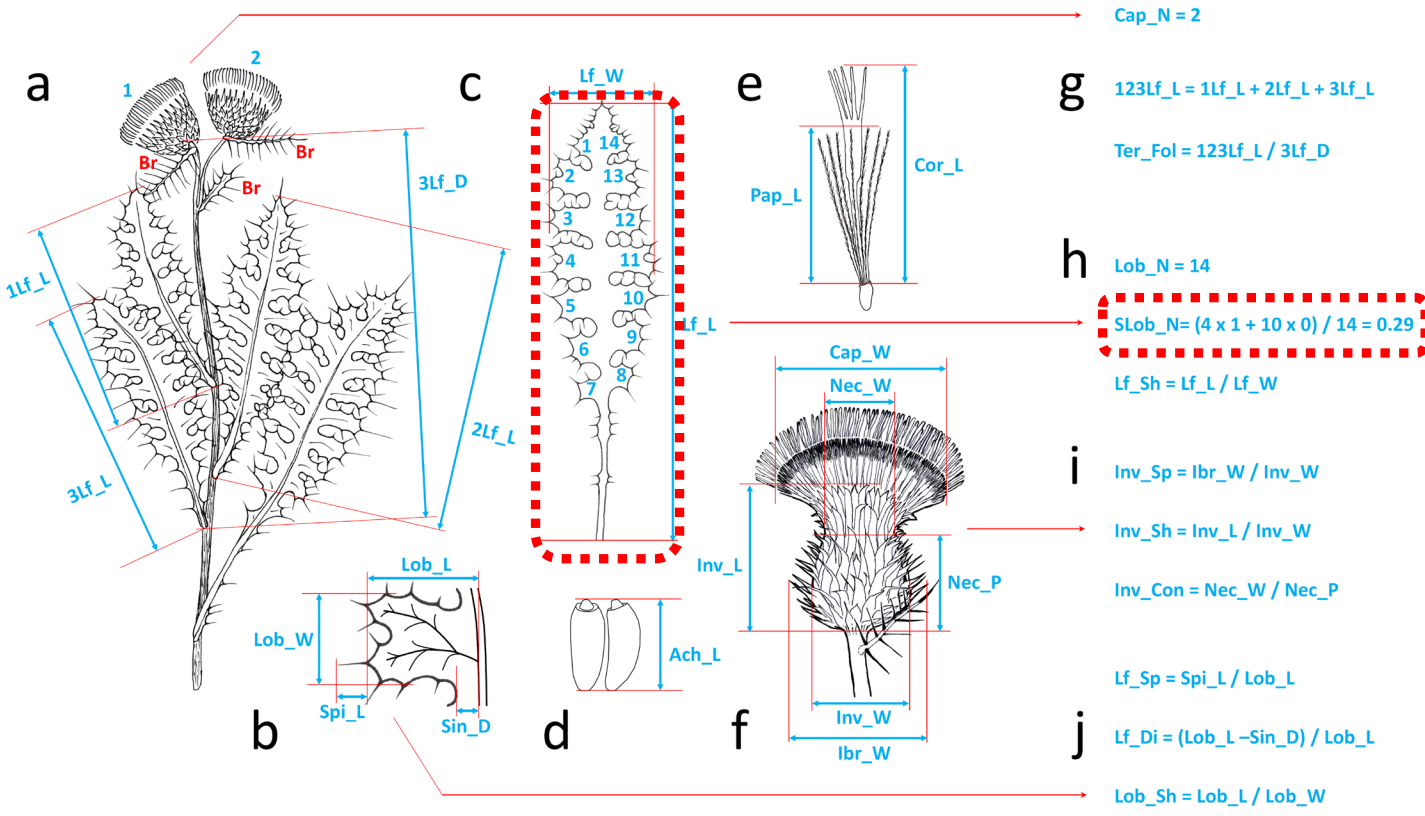


n

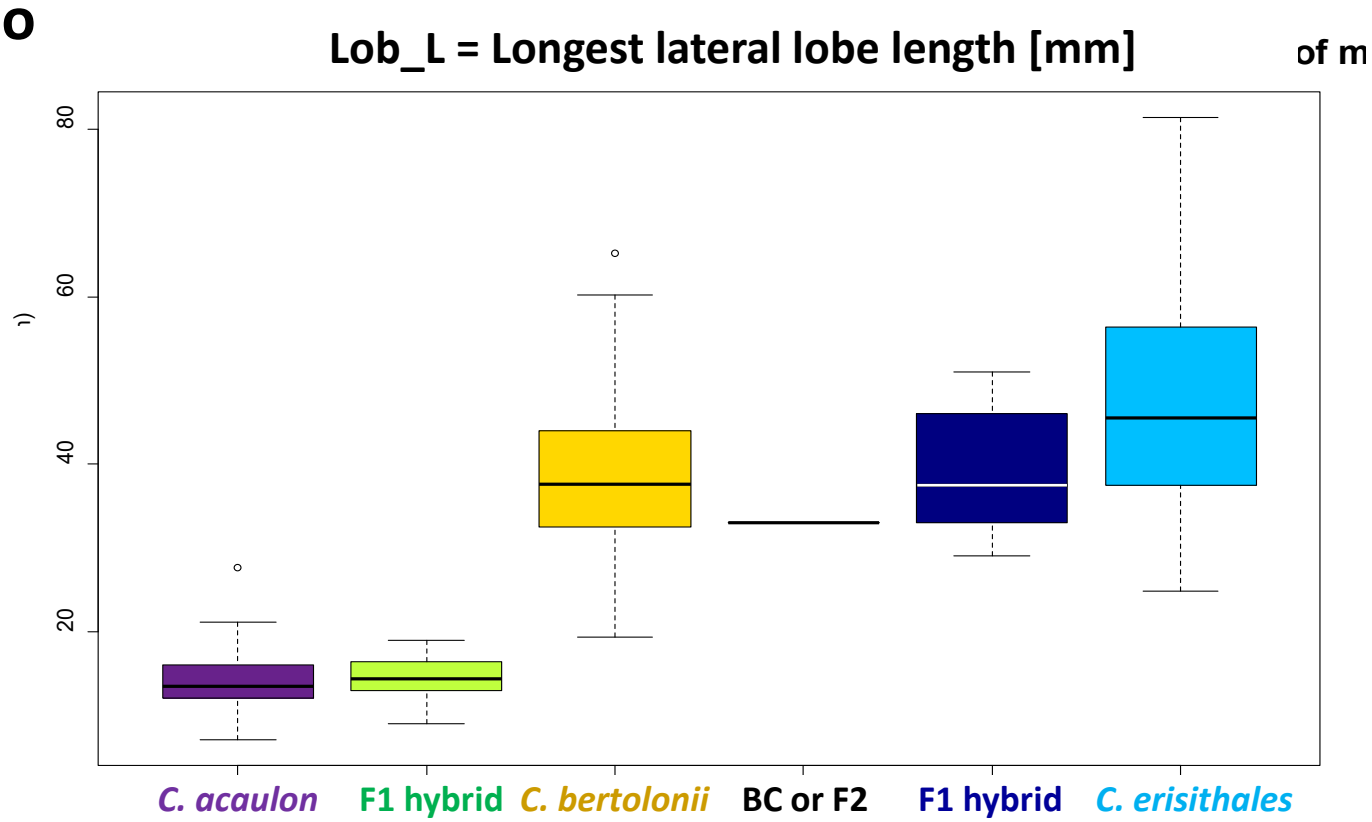
SLob_N = Number of secondary lobes



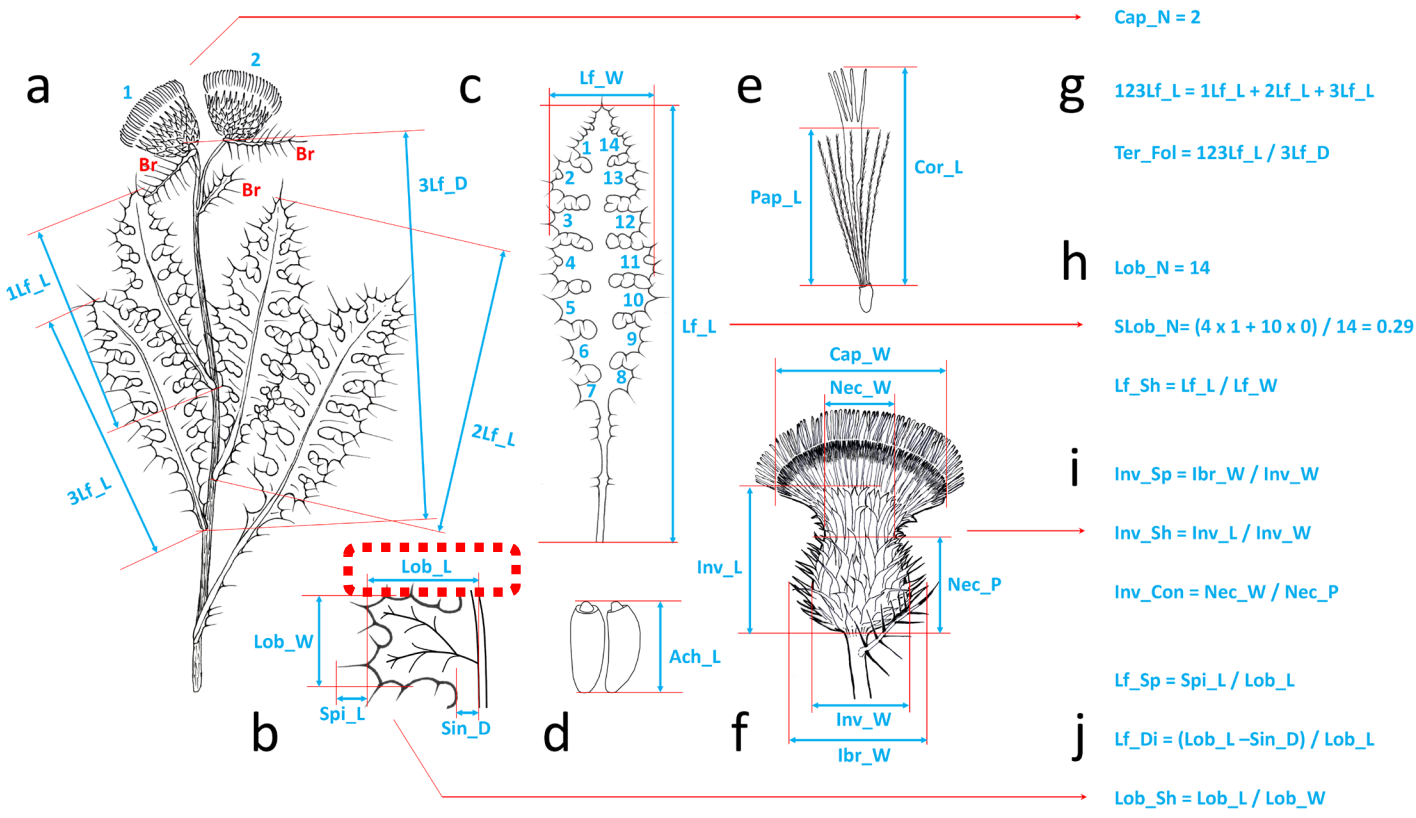
OR. 14n. Estimated on lateral lobes of well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see example **below** where one secondary lobe is present at each of the lobes No. 2, 4, 11, and 13). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



o



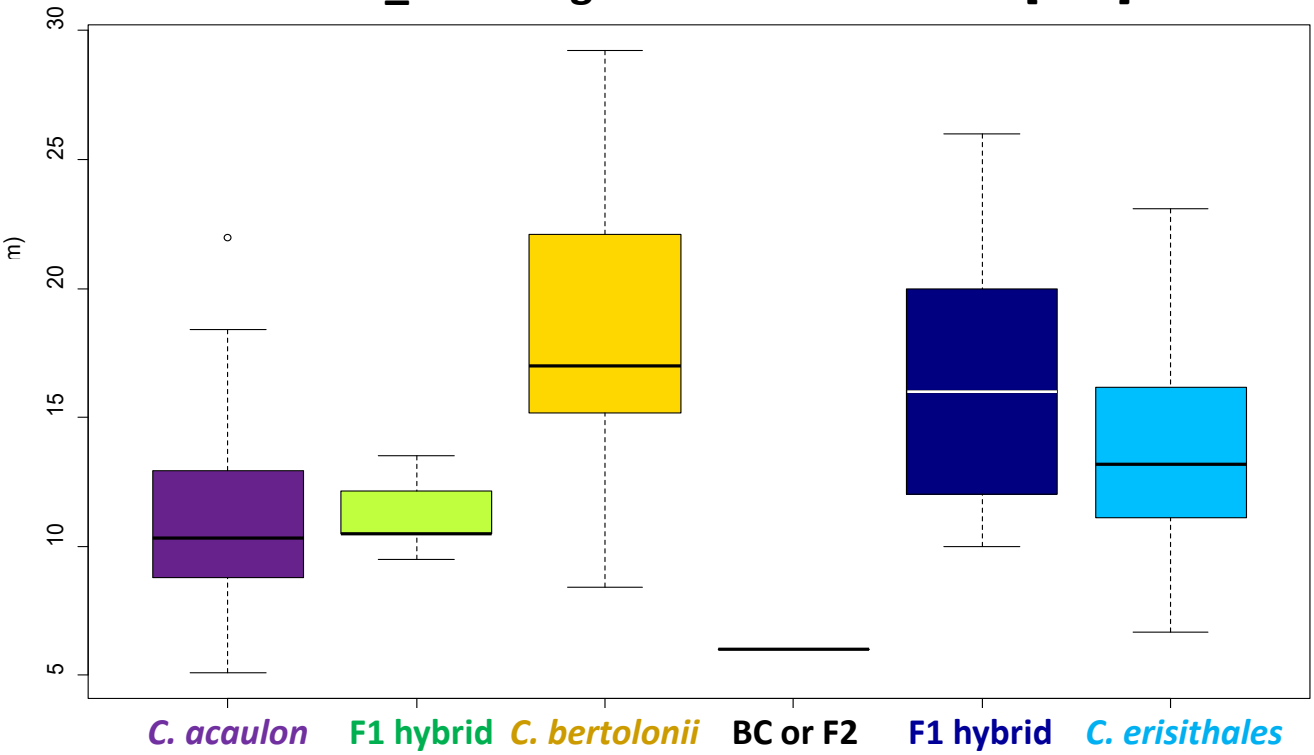
OR. 14o. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



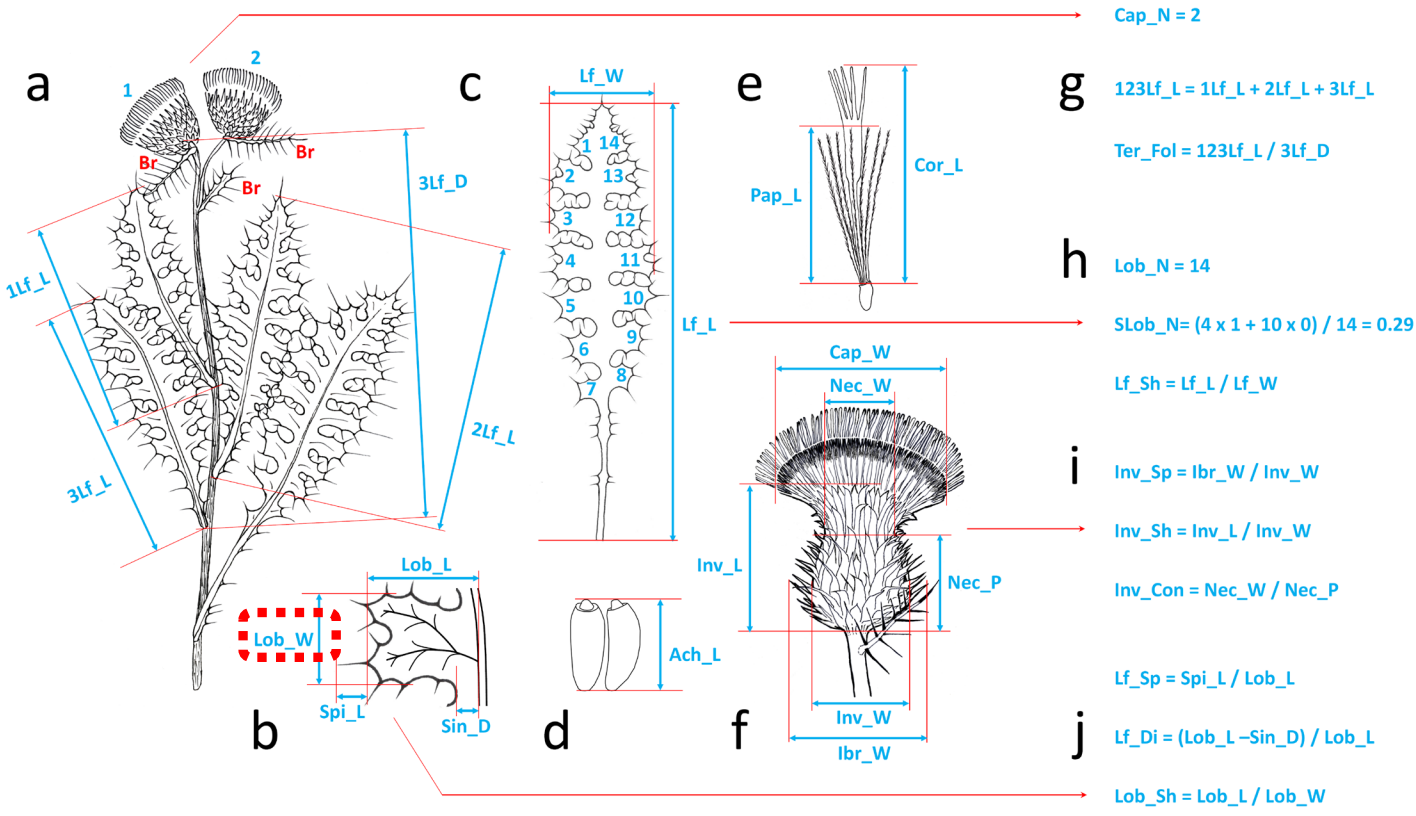
p

Lob_W = Longest lateral lobe width [mm]

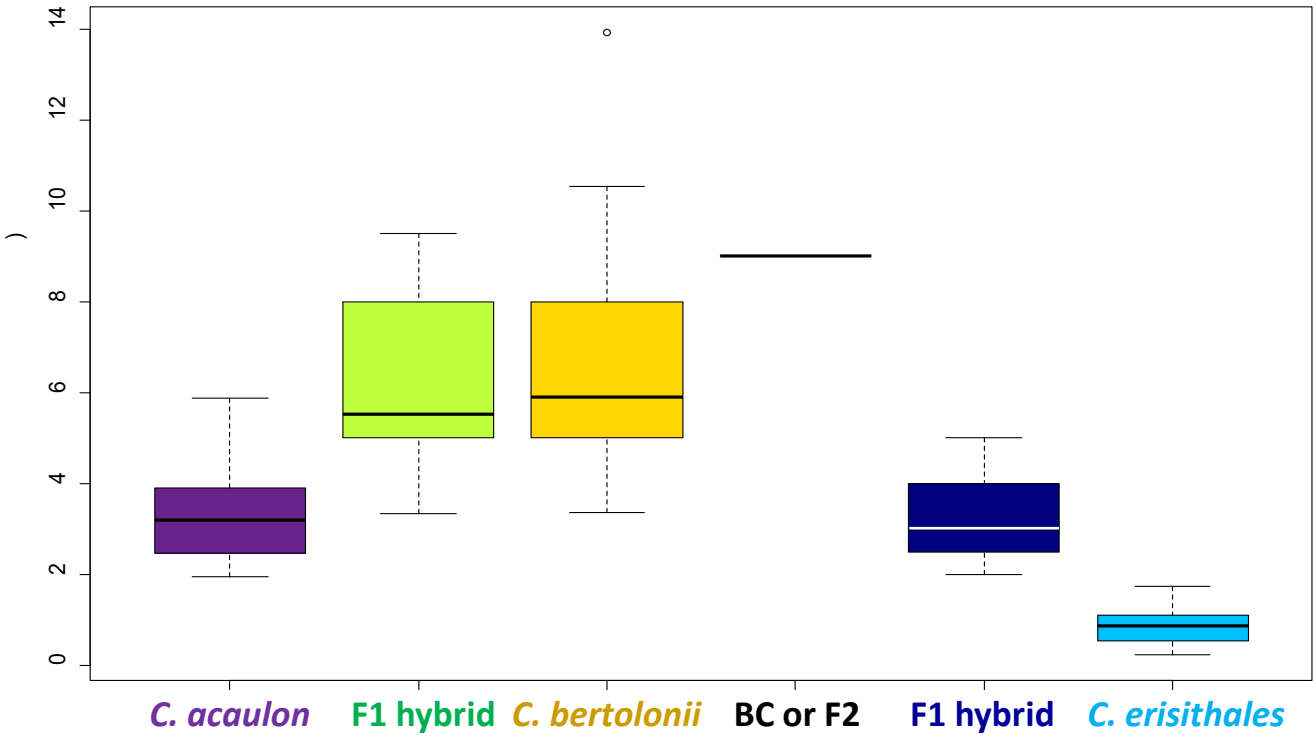
f mi



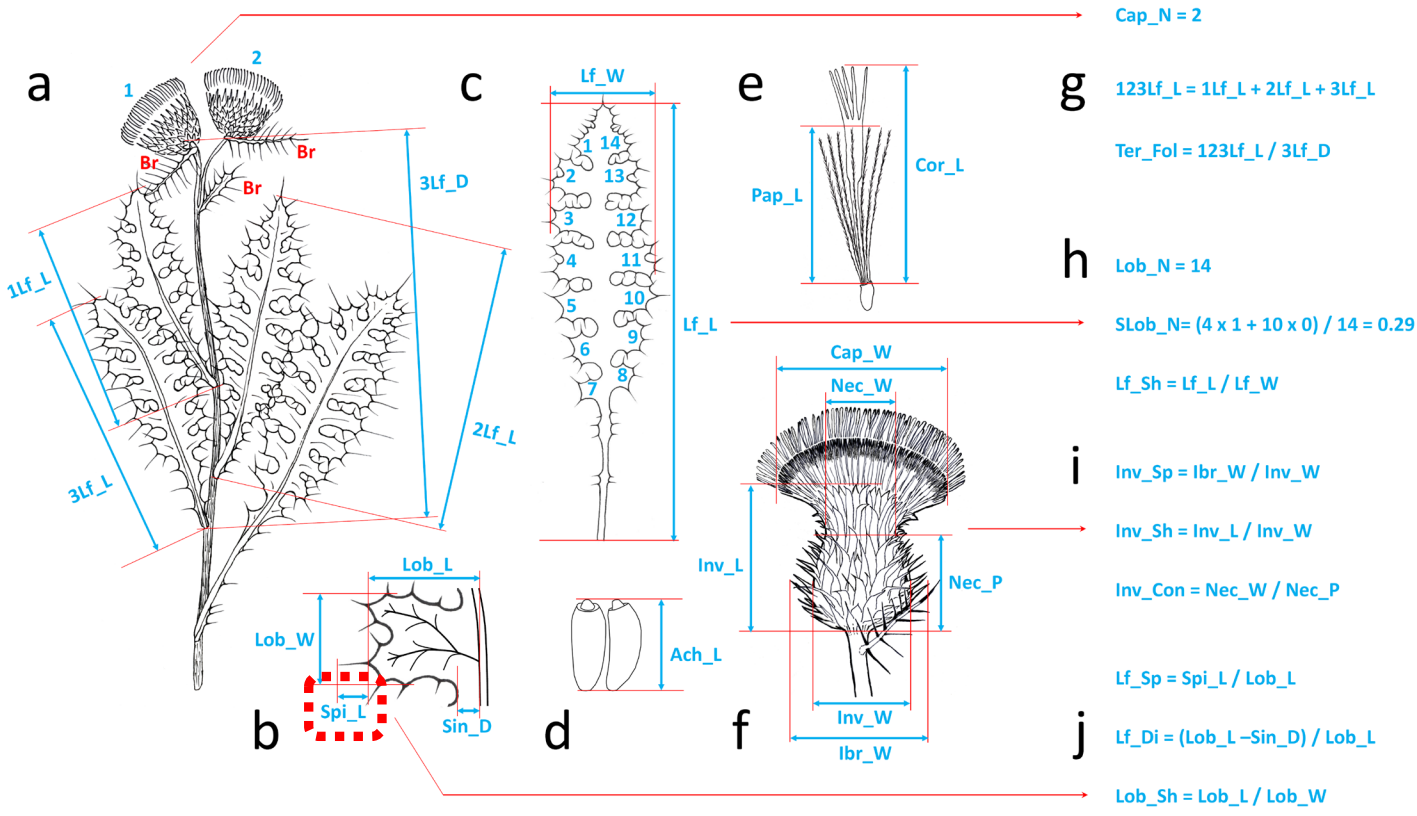
OR. 14p. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



q **Spi_L = Length of terminal spine of the longest lateral lobe [mm]**

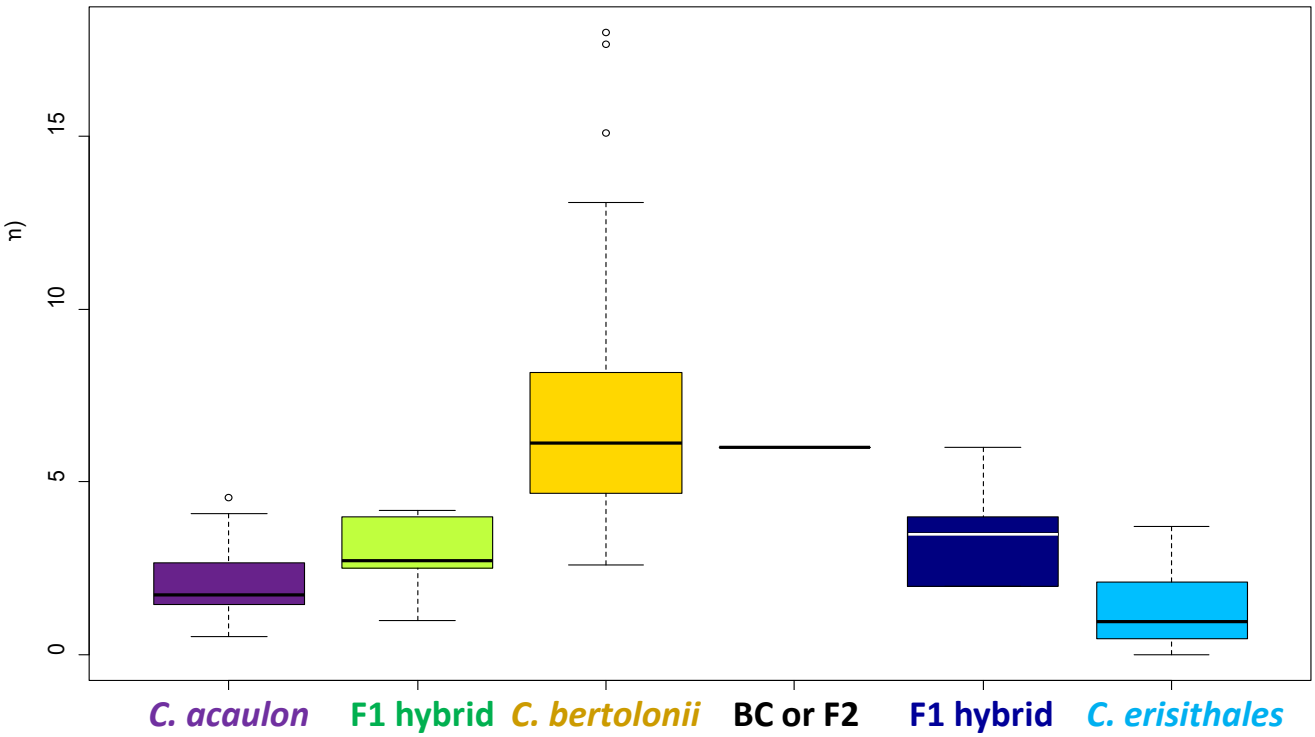


OR. 14q. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).

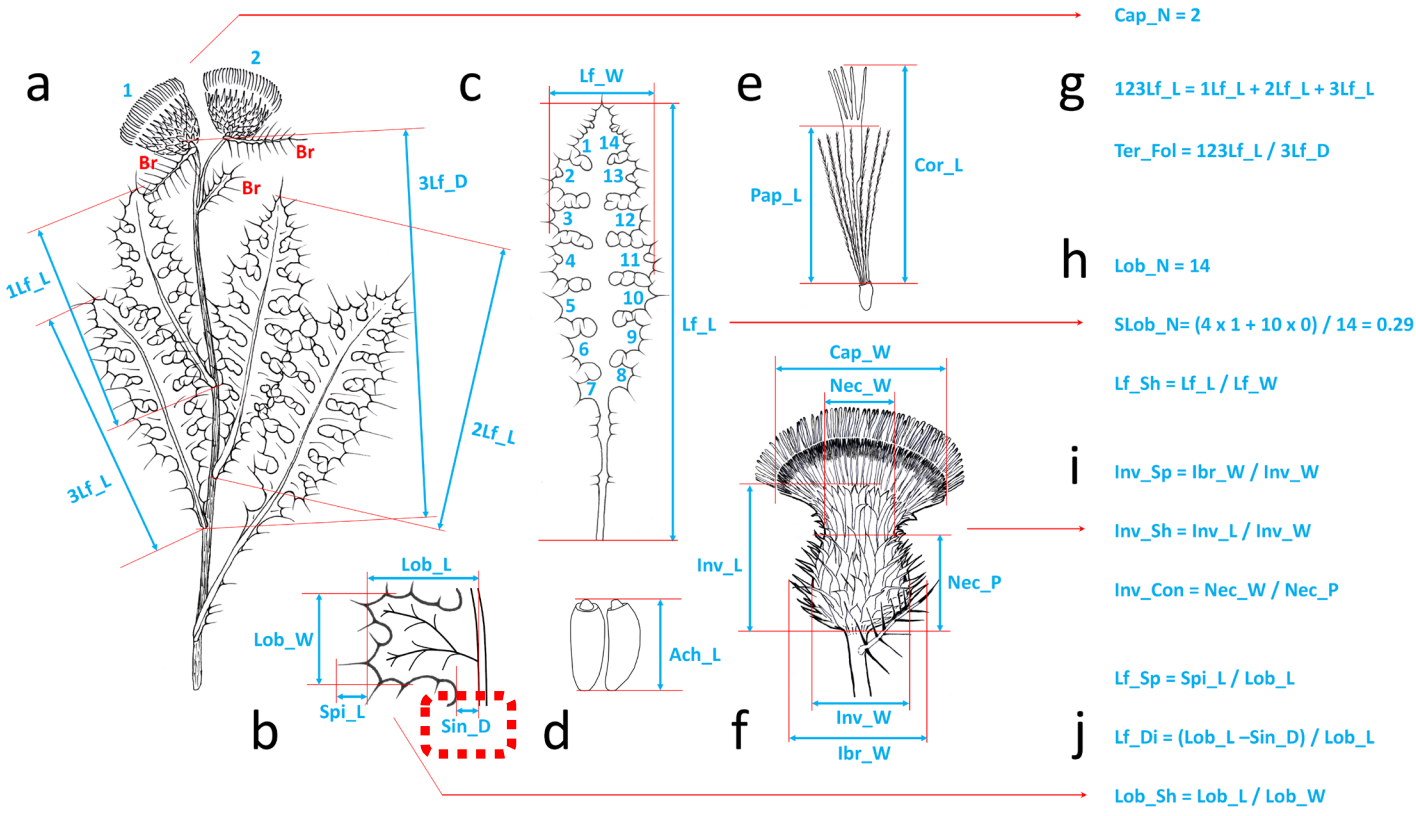


r

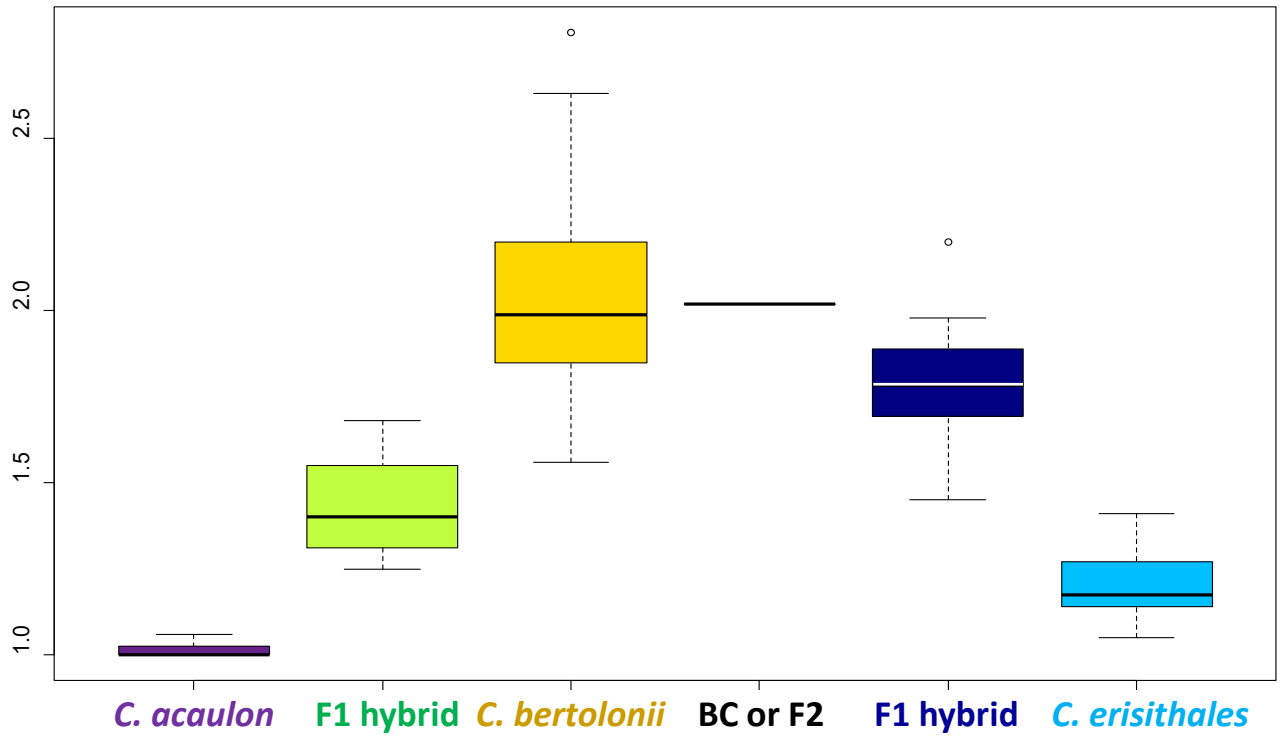
Sin_D = Sinus depth of the longest lateral lobe [mm]



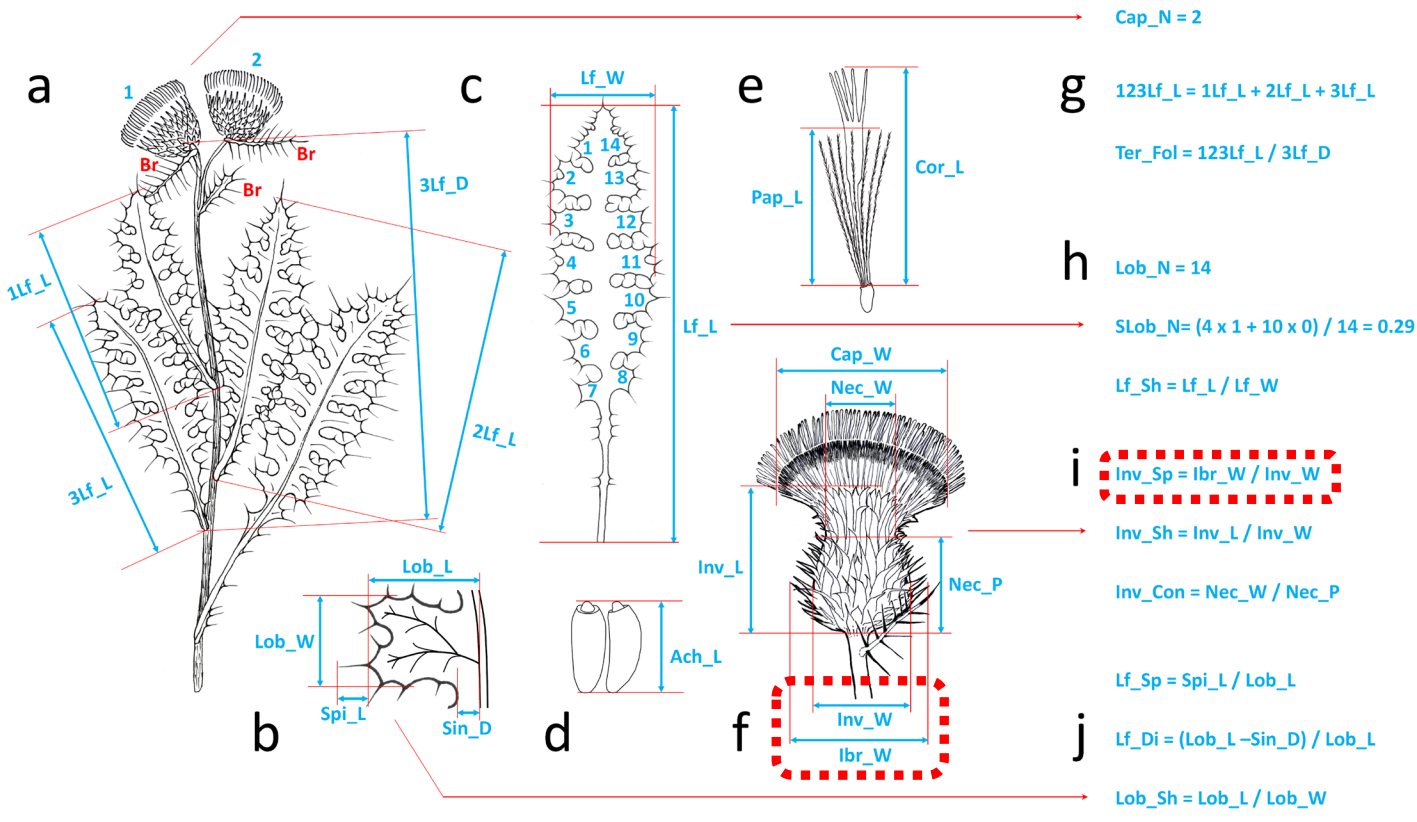
OR. 14r. Measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



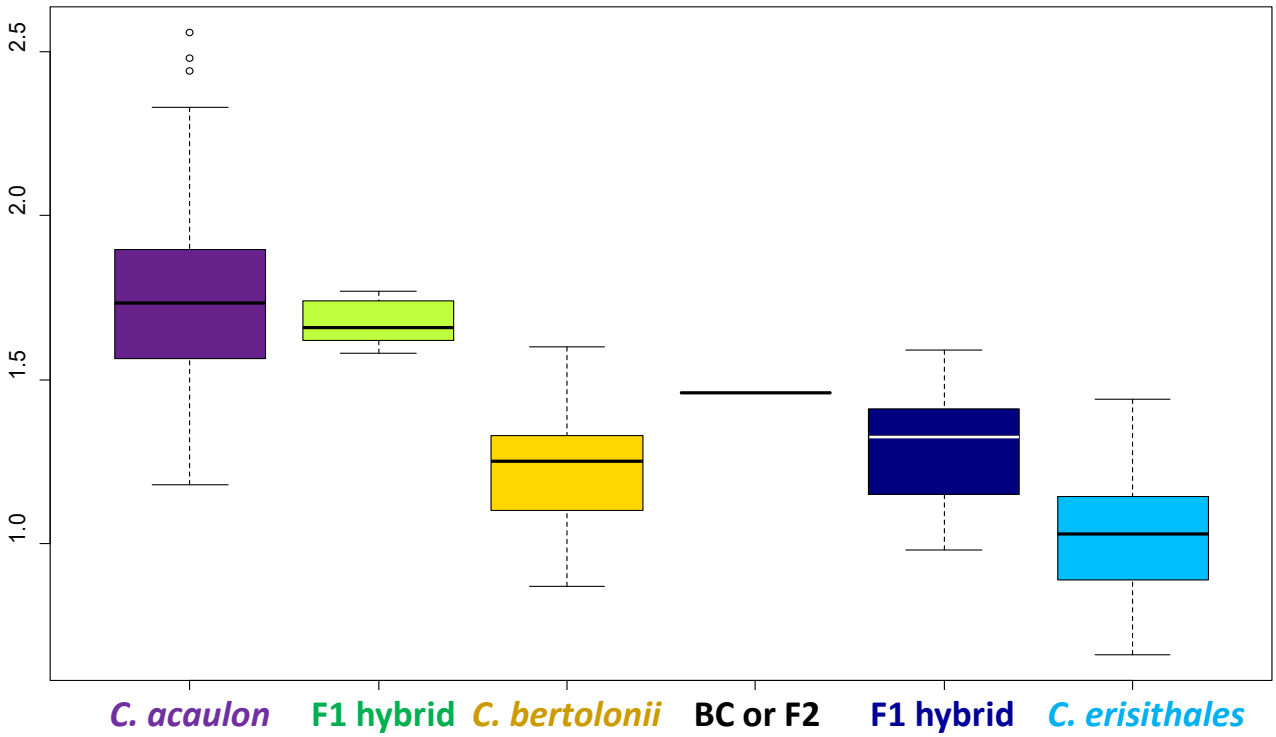
s



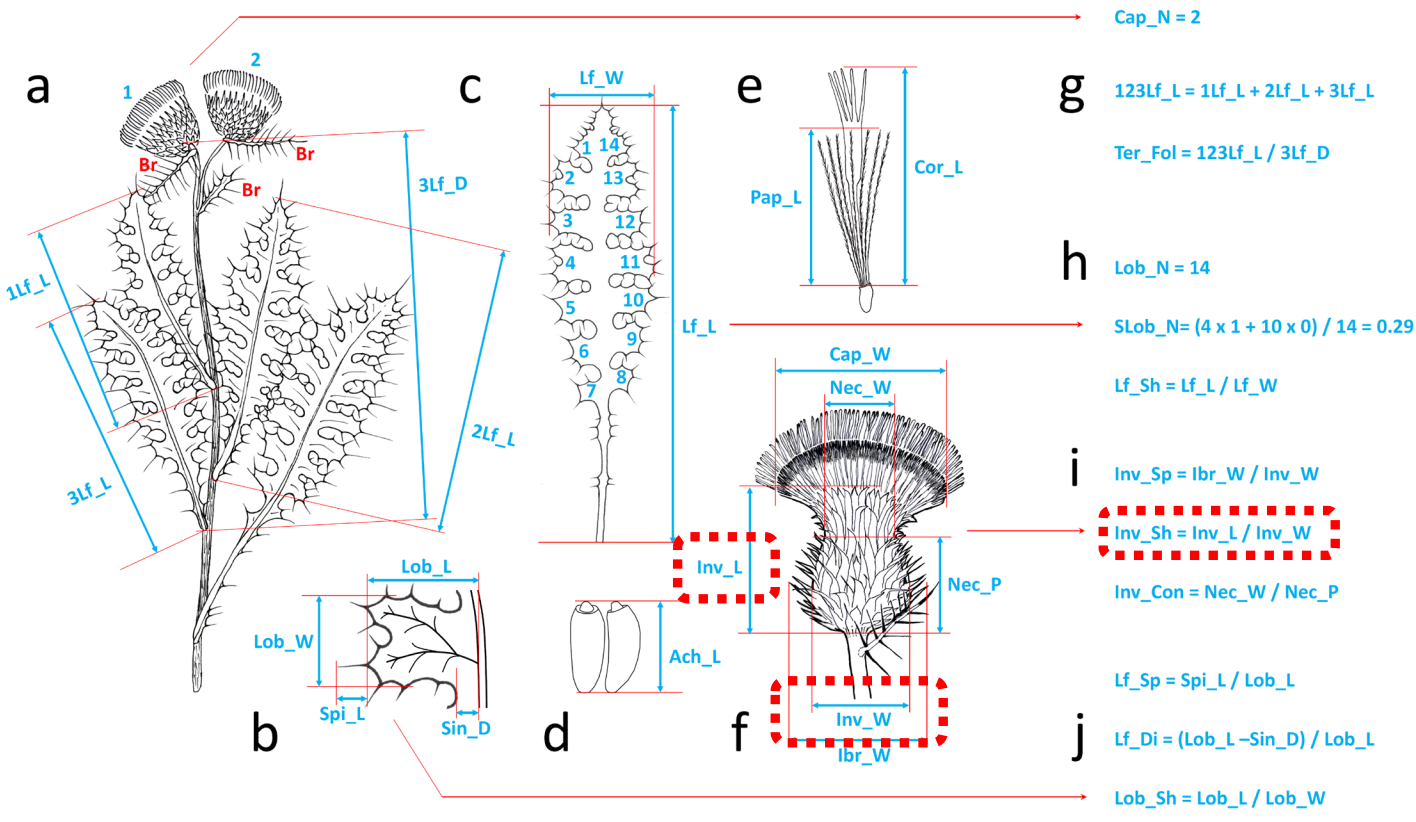
OR. 14s. Involucre width including protruding tips (terminal spines) of involucral bracts divided by involucre width without protruding tips (terminal spines) of involucral bracts – measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



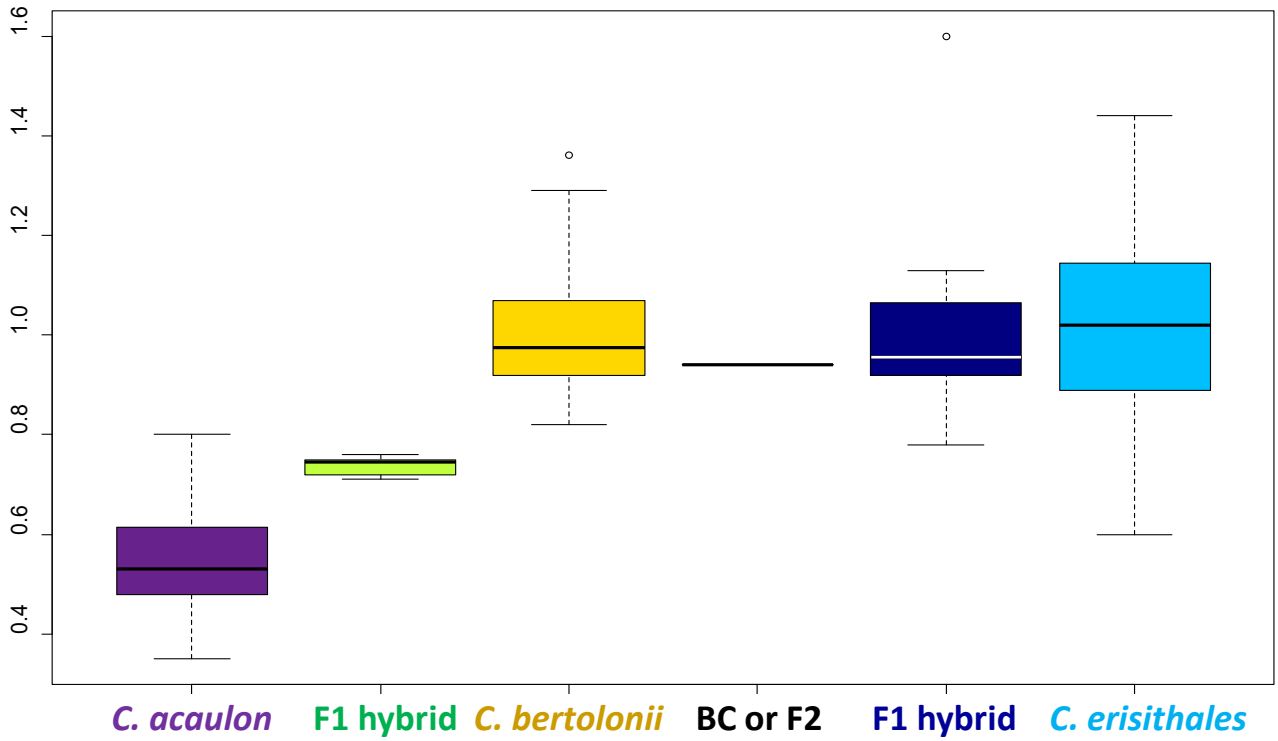
t



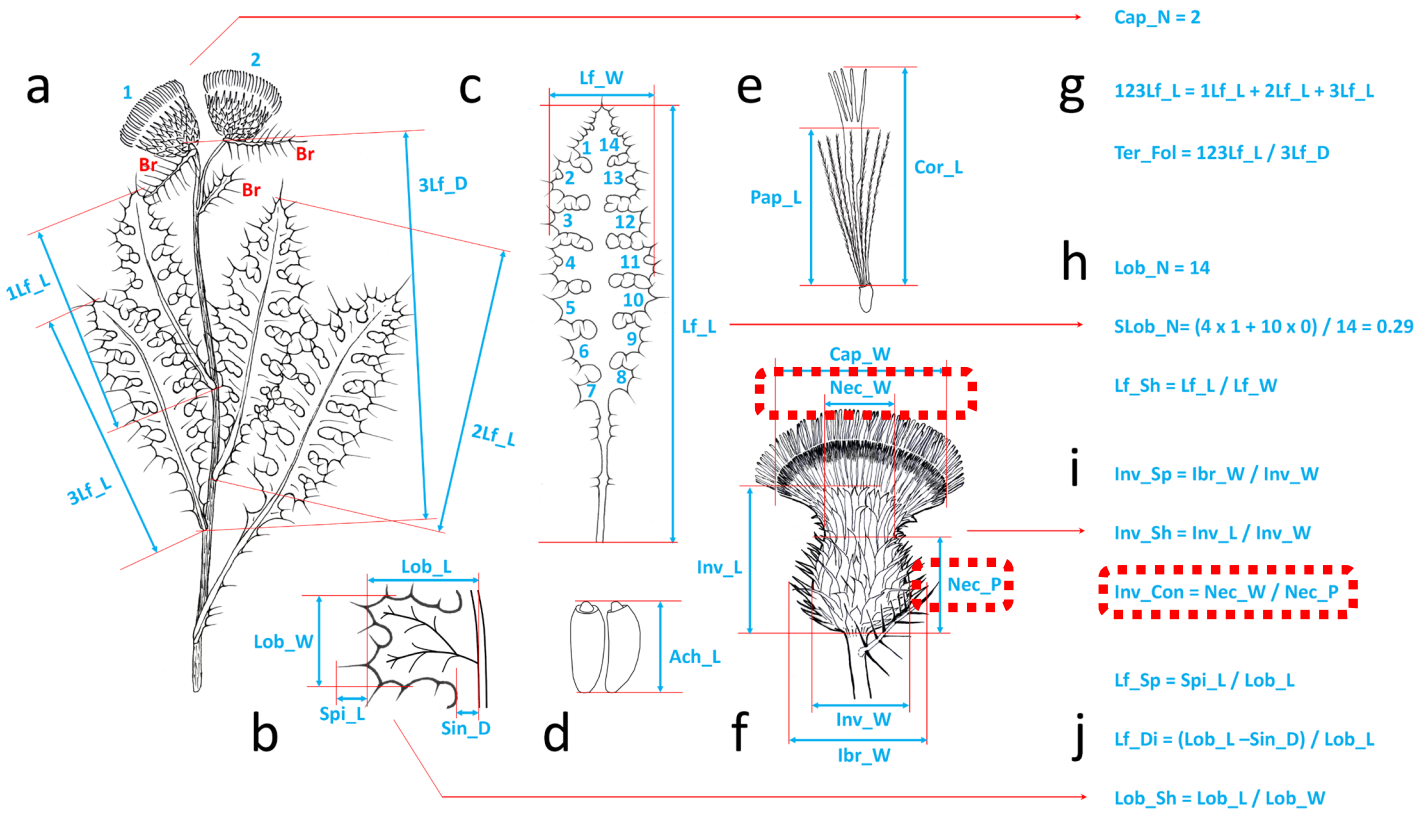
OR. 14t. Involucre length divided by involucre width – measured on fully flowering terminal capitulum (for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



u

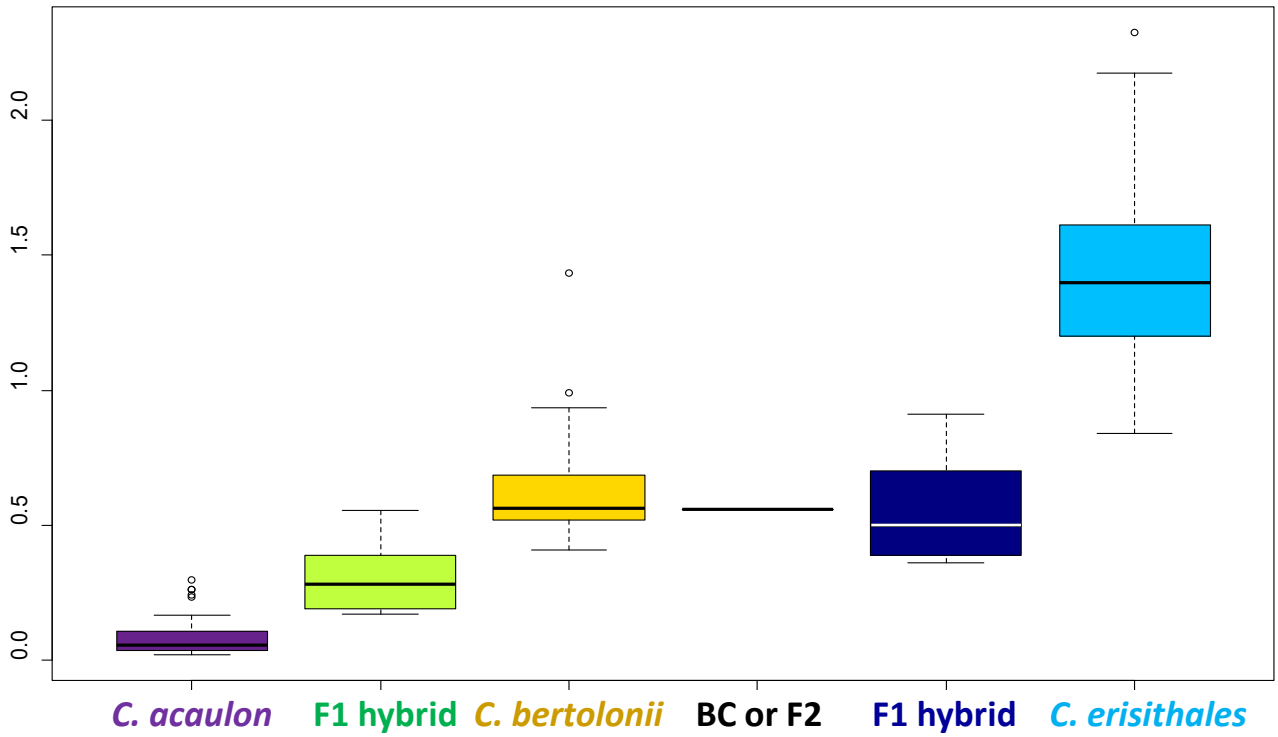


OR. 14u. Width of involucral neck divided by position of involural neck – measured on fully flowering terminal capitulum (neck means constricted part of involucre; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).

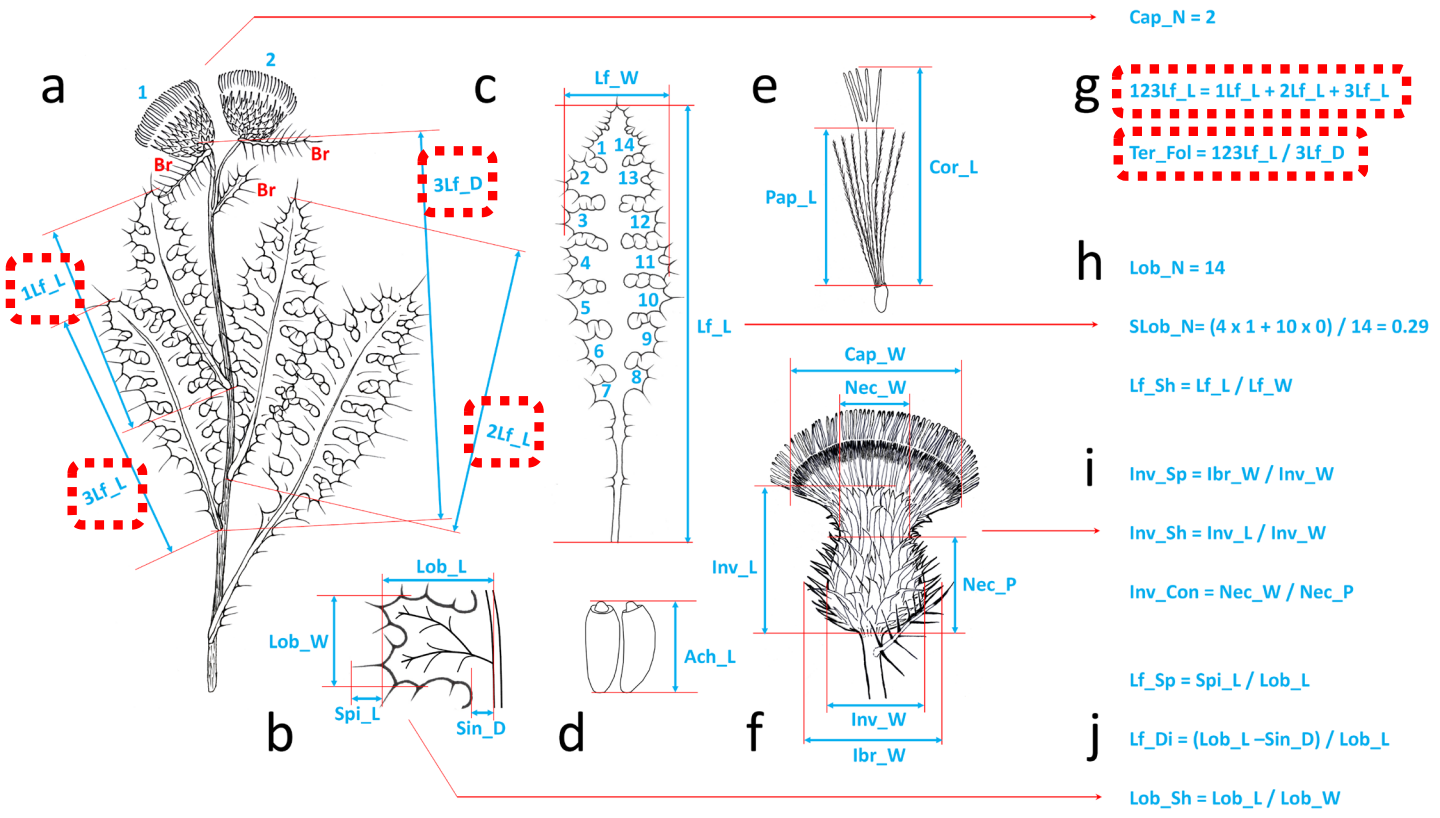


v

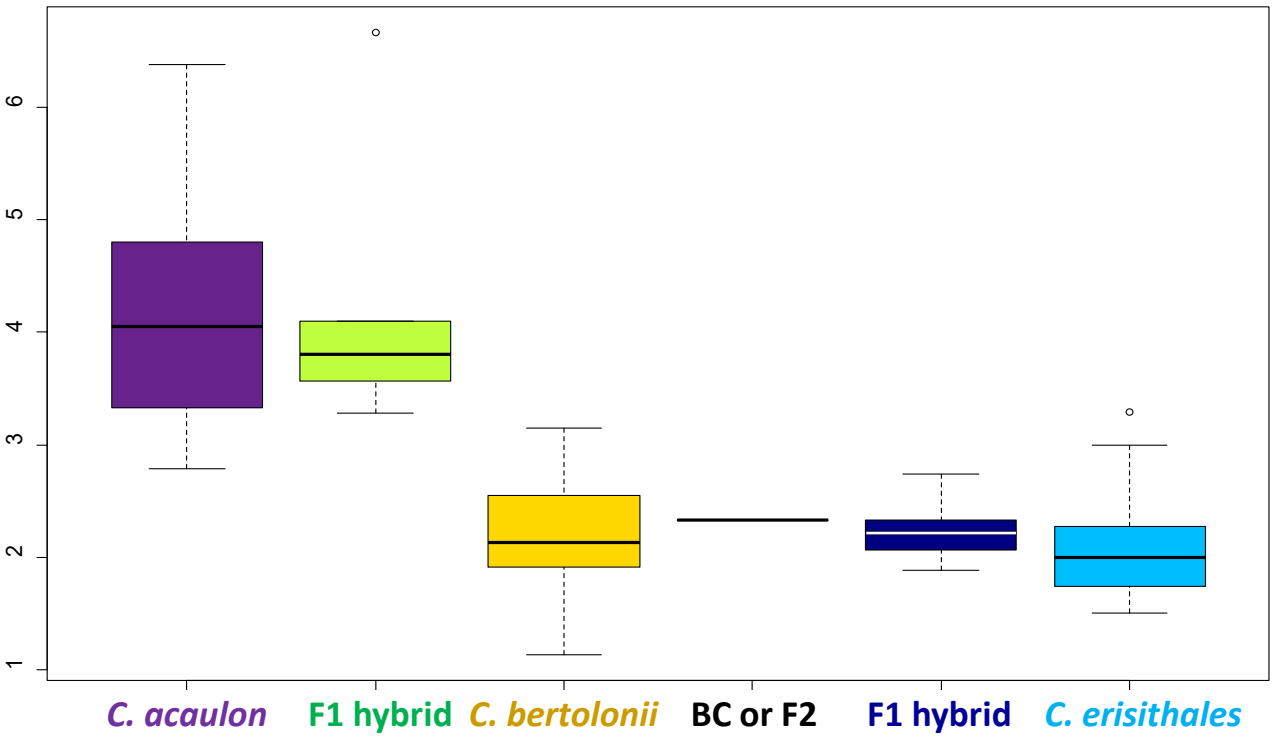
Ter_Fol = Terminal foliage = 3Lf_D / 123Lf_L



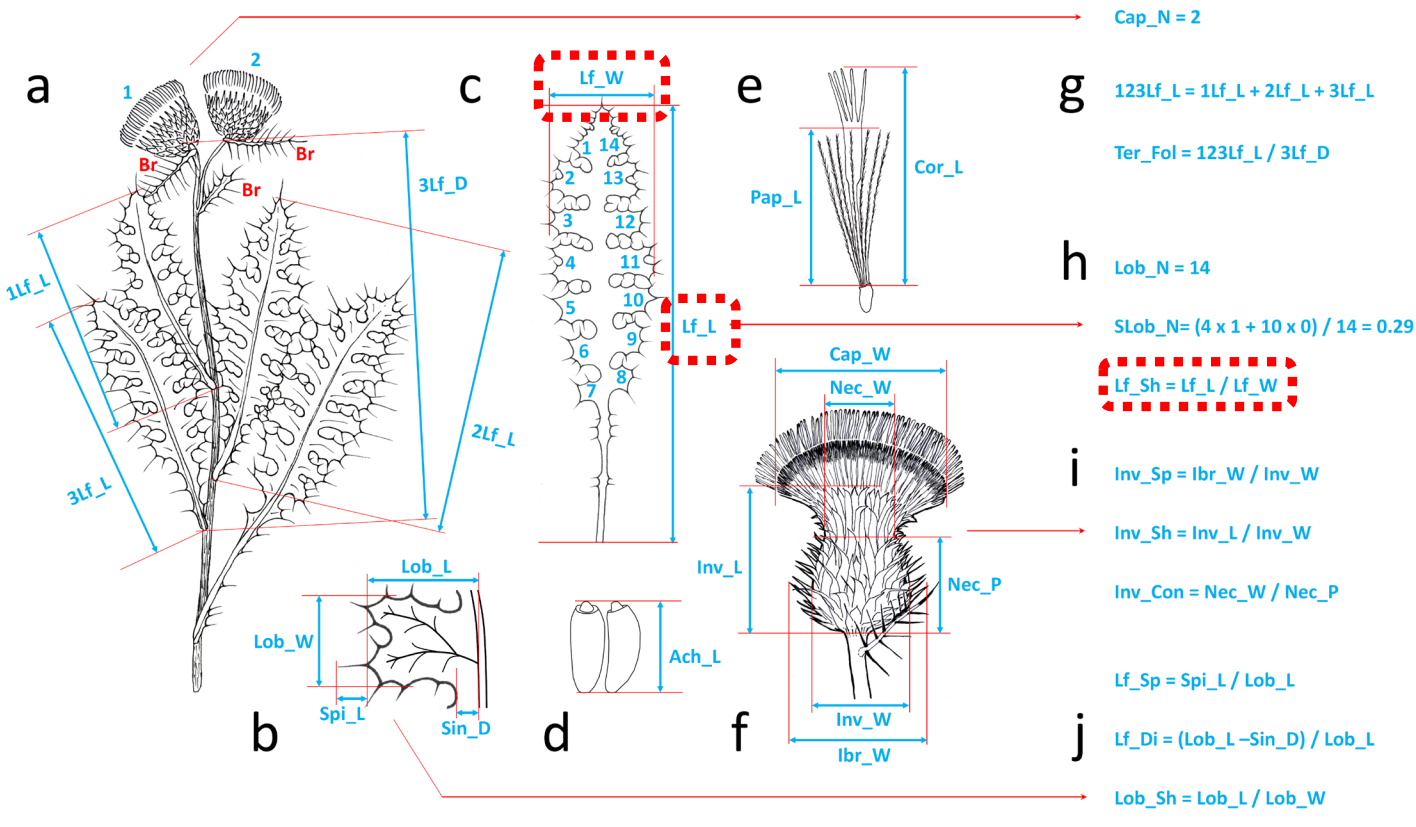
OR. 14v. Distance between base of terminal capitulum and 3rd leaf-stem connection divided by sum of lengths of uppermost three stem leaves – only foliage leaves were measured not bracts (= modified leaves subtending capitulum or its peduncle usually more simple in division than leaves – Br **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



w

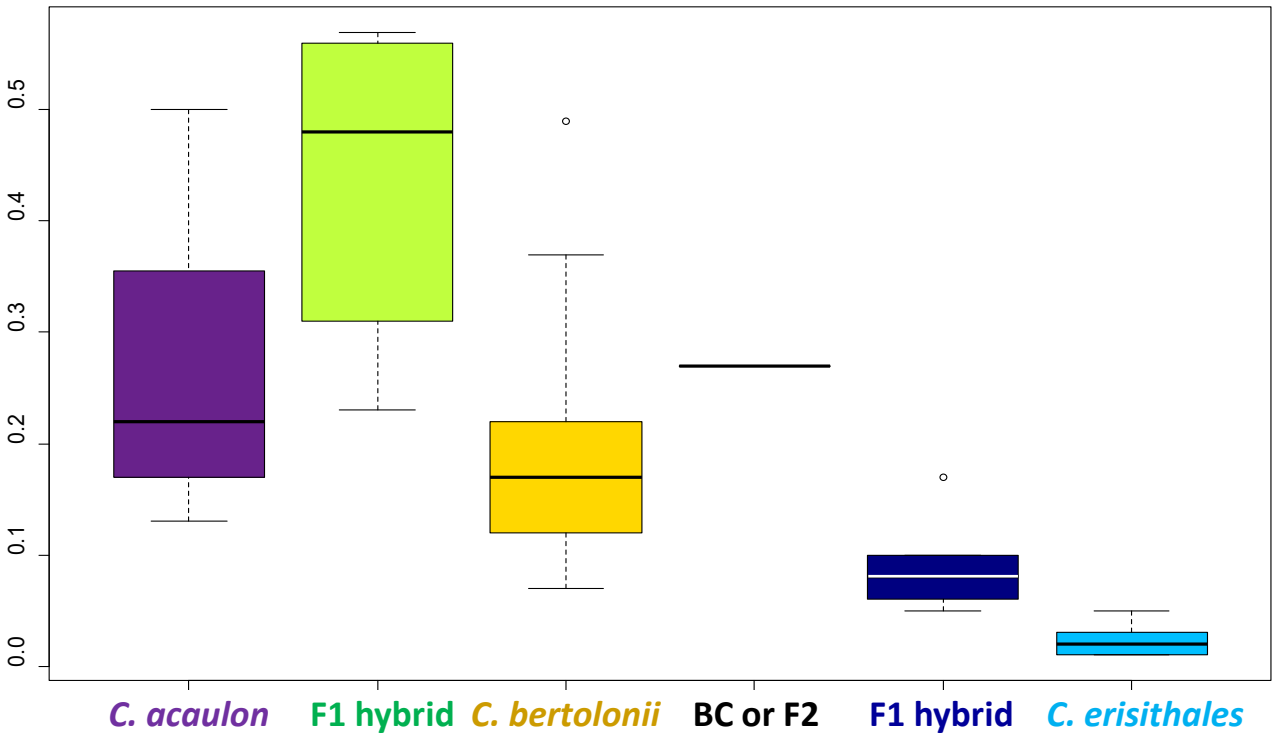


OR. 14w. Leaf length divided by leaf width – measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).

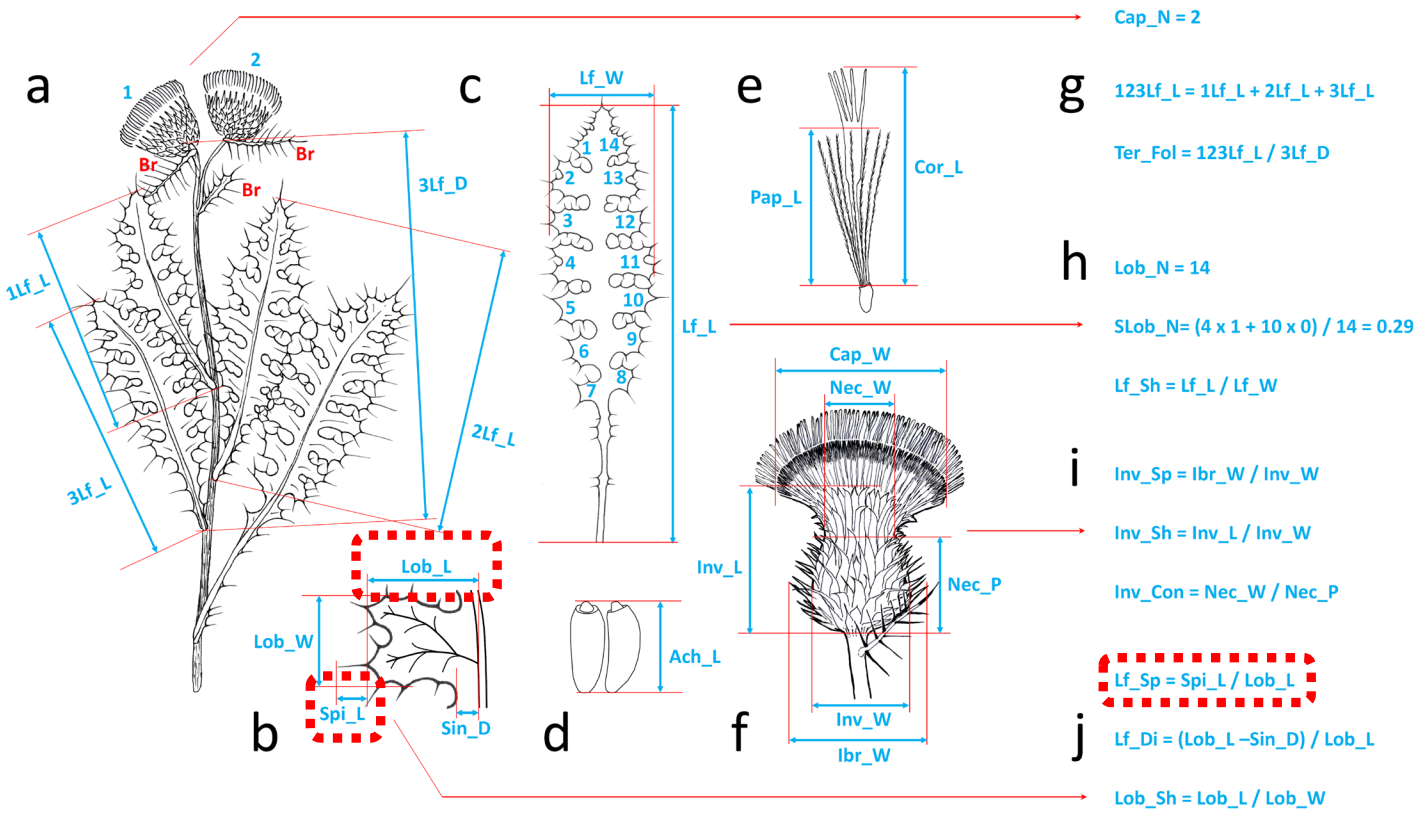


x

b_L

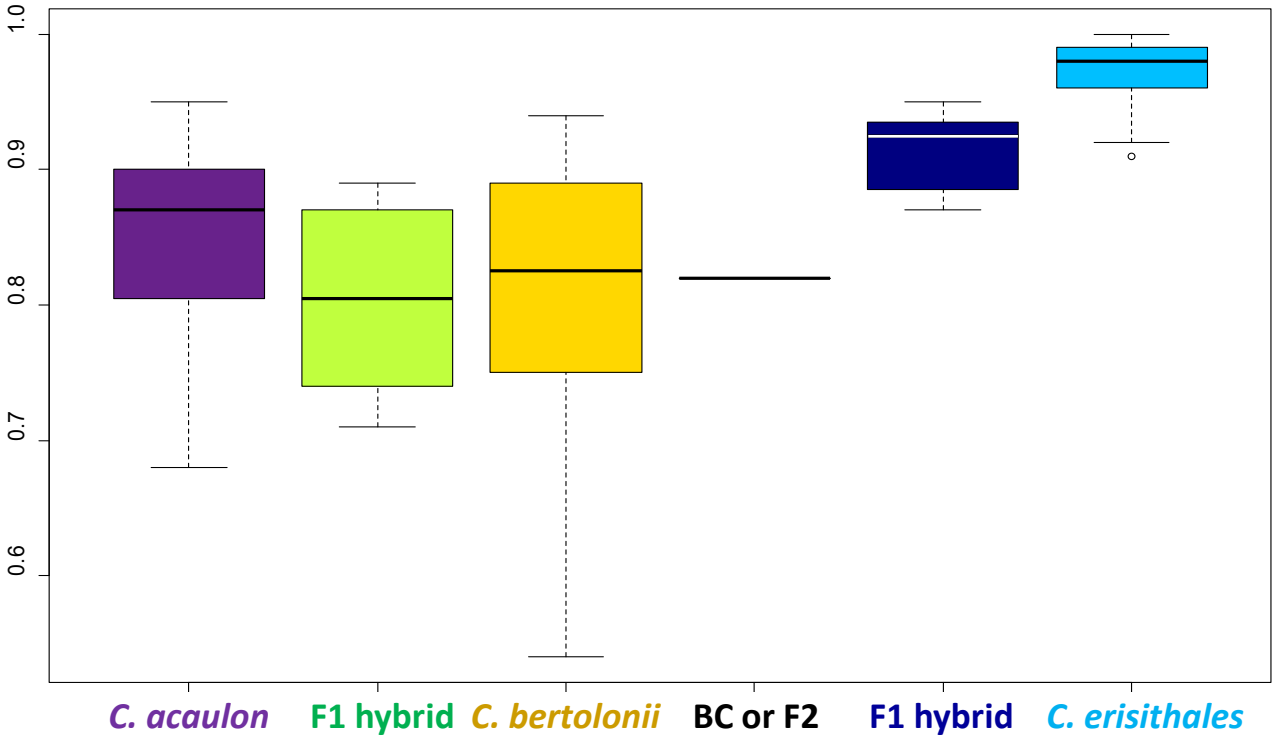


OR. 14x. Terminal spine of the longest lateral lobe divided by the length of the longest lateral lobe – measured on well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).

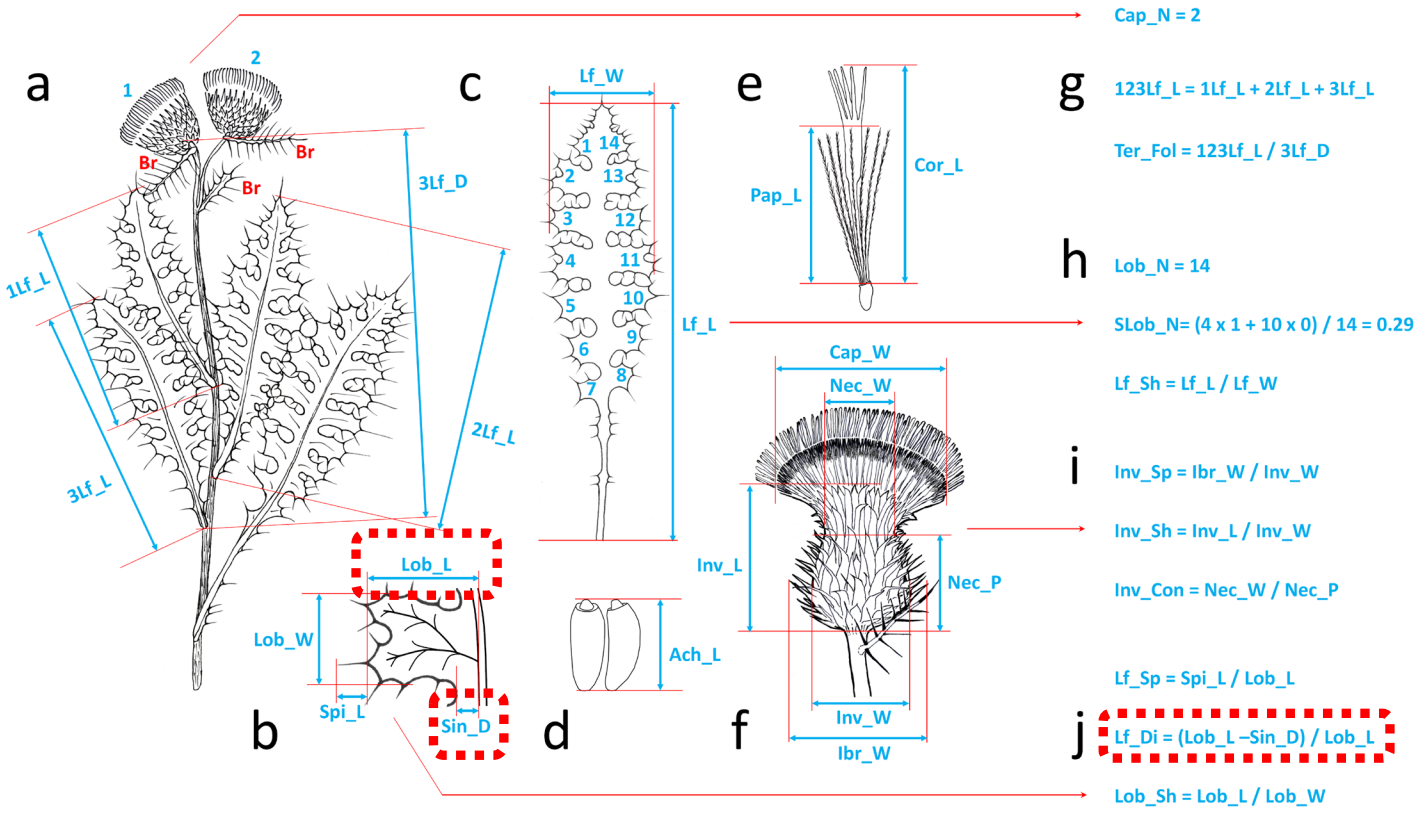


y

Lf_Di = Leaf division = (Lob_L – Sin_D) / Lob_L



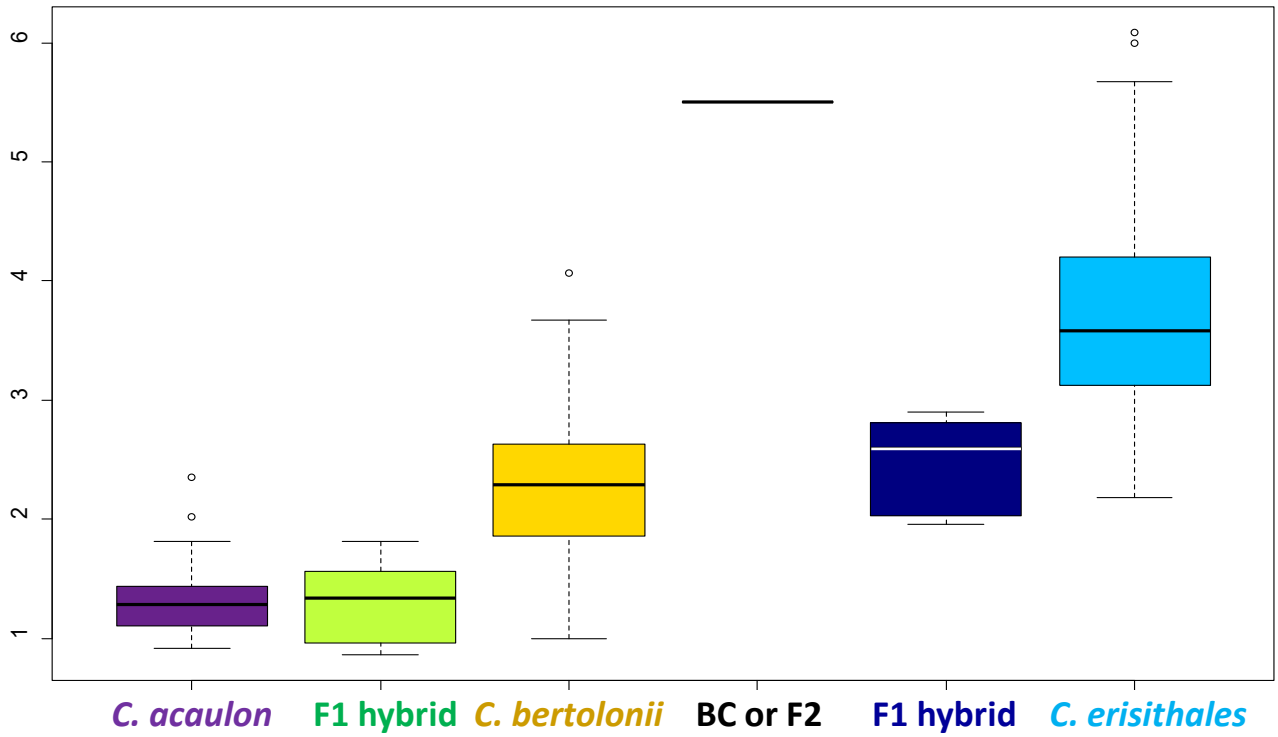
OR. 14y. (Lobe length minus sinus depth) divided by lobe length – measured on the longest lateral lobe of well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).



z

Lob_Sh = Leaf lobe shape = Lob_L / Lob_W

f = L



OR. 14z. Lobe length divided by lobe width – measured on the longest lateral lobe of well developed middle stem leaf (usually on 3rd or 4th leaf counted down from terminal capitulum; for more details, see **below**). Boxplots show median (thick line), interquartile range (boxes), non-outlier range (whiskers), and outliers (empty circles).