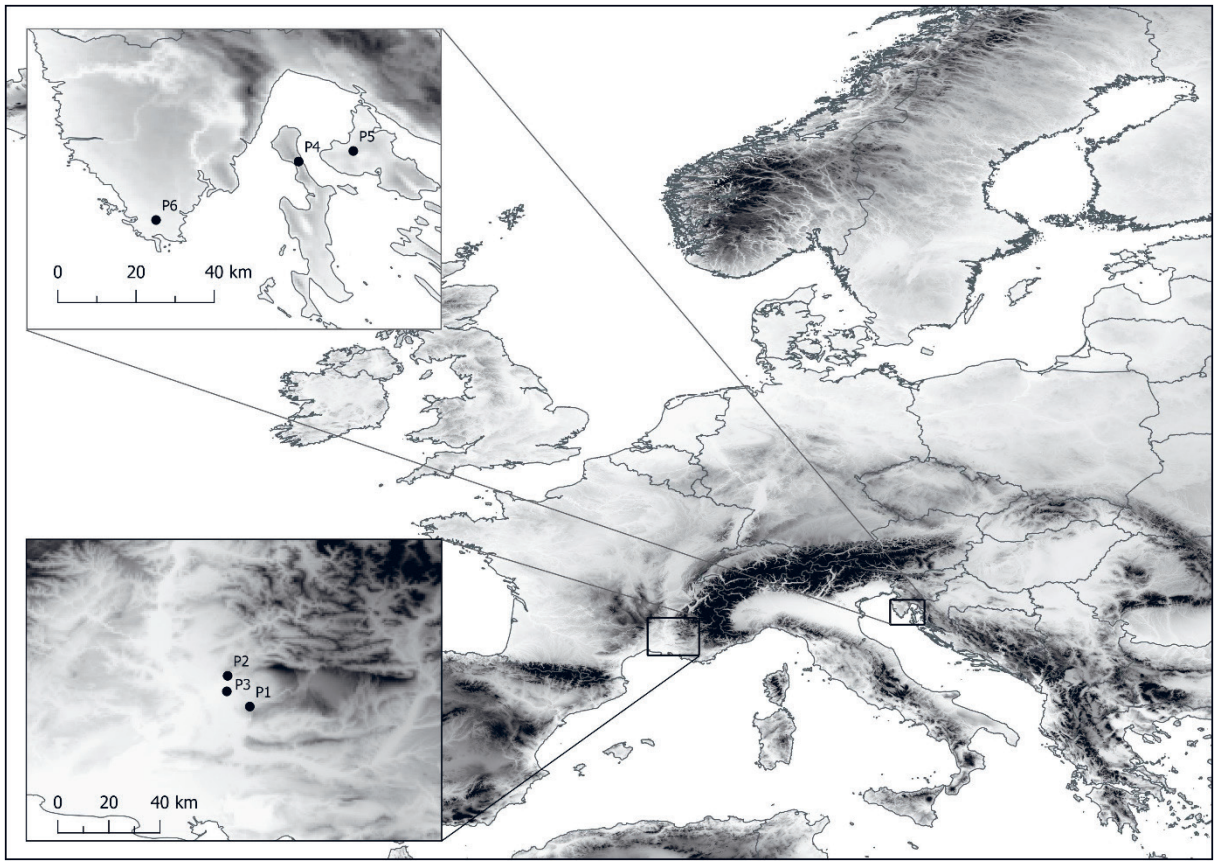
ON-LINE SUPPLEMENTARY MATERIAL

Vidaković A., Šatović Z., Tumpa K., Idžojtić M., Barišić A., Poljak I.: Secondary sexual dimorphism and morphological diversity in two allopatric juniper species: *Juniperus oxycedrus* and *J. deltoides*. Acta Bot Croat, DOI: 10.37427/botcro-2024-007.



On-line Suppl. Fig. 1. Locations of the studied populations. Populations: P1 – Le Beaucet; P2 – Grand Vallat; P3 – Les Plantades; P4 – Cres; P5 – Krk; P6 – Pula.

On-line Suppl. Tab. 1. Pearson's correlation coefficients between analysed needle traits. Needle morphometric traits acronyms: NA – needle area; NL – needle length; MNW – maximum needle width; PMNW – needle length, measured from the needle base to the point of maximum needle width; NW50 – needle width at 50% of needle length; NW90 – needle width at 90% of needle length; NA10 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 10% of total needle length; NA25 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 25% of total needle length. n.s. – not significant at P > 0.05; * – 0.01 < P < 0.05; ** – 0.001 < P < 0.01; *** – P < 0.001.

	NA	NL	MNW	PMNW	NW50	NW90	NA10	NA25
NA		***	***	***	***	***	***	***
NL	0.908		***	***	***	***	***	***
MNW	0.732	0.429		***	***	***	n.s.	n.s.
PMNW	0.828	0.735	0.510		***	***	***	***
NW50	0.725	0.391	0.893	0.683		***	n.s.	n.s.
NW90	0.621	0.365	0.602	0.702	0.786		**	n.s.
NA10	-0.634	-0.840	0.011	-0.672	-0.094	-0.258		***
NA25	-0.536	-0.800	0.117	-0.493	0.079	-0.072	0.963	

On-line Suppl. Tab. 2. Pearson's correlation coefficients between analysed cone traits. Cone morphometric traits acronyms: CL – cone length; CW – cone width; NCS – number of cone scales; NS – number of seeds; SL – seed length; SW – seed width; ST – seed thickness. n.s. – not significant at P > 0.05; * – 0.01 < P < 0.05; ** – 0.001 < P < 0.01; *** – P < 0.001.

	CL	CW	NCS	NS	SL	SW	ST
CL		***	***	n.s.	***	***	***
CW	0.831		***	n.s.	***	***	***
NCS	0.508	0.499		n.s.	**	n.s.	n.s.
NS	0.232	0.227	0.154		n.s.	n.s.	*
SL	0.873	0.731	0.379	0.232		***	***
SW	0.830	0.658	0.242	0.073	0.834		***
ST	0.724	0.572	0.121	0.298	0.739	0.853	

On-line Suppl. Tab. 3. Pearson's correlation coefficients between analysed needle and cone traits. Needle morphometric traits acronyms: NA – needle area; NL – needle length; MNW – maximum needle width; PMNW – needle length, measured from the needle base to the point of maximum needle width; NW50 – needle width at 50% of needle length; NW90 – needle width at 90% of needle length; NA10 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 10% of total needle length; NA25 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 25% of total needle length. Cone morphometric traits acronyms: CL – cone length; CW – cone width; NCS – number of cone scales; NS – number of seeds; SL – seed length; SW – seed width; ST – seed thickness. n.s. – not significant at P > 0.05; * – 0.01 < P < 0.05; ** – 0.001 < P < 0.01; *** – P < 0.001.

	NA	NL	MNW	PMNW	NW50	NW90	NA10	NA25
CL	0.588***	0.473***	0.593***	0.506***	0.584***	0.588***	-0.303*	-0.103n.s.
CW	0.482***	0.417**	0.435***	0.432***	0.441***	0.436***	-0.279*	-0.146n.s.
NCS	0.379**	0.283*	0.360**	0.413**	0.424***	0.330*	-0.206n.s.	-0.043n.s.
NS	0.169n.s.	0.116n.s.	0.104n.s.	0.175n.s.	0.169n.s.	0.290*	-0.085n.s.	-0.031n.s.
SL	0.507***	0.416**	0.488***	0.465***	0.482***	0.502***	-0.293*	-0.131n.s.
SW	0.612***	0.529***	0.549***	0.543***	0.563***	0.563***	-0.381**	-0.205n.s.
ST	0.505***	0.474***	0.396**	0.394**	0.409**	0.492***	-0.395**	-0.274*

On-line Suppl. Tab. 4. Descriptive statistics for analysed needle traits of *Juniperus oxycedrus* and *J. deltoides* from six studied populations, individually by sex (M – male, F – female) in each population and total (T). $\bar{X}$ – arithmetic mean; CV – coefficient of variation (%). Needle morphometric traits acronyms: NA – needle area; NL – needle length; MNW – maximum needle width; PMNW – needle length, measured from the needle base to the point of maximum needle width; NW50 – needle width at 50% of needle length; NW90 – needle width at 90% of needle length; NA10 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 10% of total needle length; NA25 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 25% of total needle length. Populations: P1 – Le Beaucet; P2 – Grand Vallat; P3 – Les Plantades; P4 – Cres; P5 – Krk; P6 – Pula.

Trait	Descriptive parameter	*J. oxycedrus*									*J. deltoides*								
		P1			P2			P3			P4			P5			P6		
		T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F
NA (mm^2)	$\bar{X}$	0.19	0.19	0.20	0.18	0.18	0.17	0.20	0.18	0.22	0.12	0.12	0.13	0.12	0.11	0.13	0.12	0.10	0.13
	CV	20.27	21.91	18.25	27.74	24.56	30.67	23.59	18.76	24.11	27.00	31.25	22.19	28.89	28.82	26.57	30.02	28.93	24.42
NL (mm)	$\bar{X}$	1.67	1.76	1.59	1.47	1.47	1.47	1.54	1.44	1.65	1.20	1.14	1.26	1.23	1.14	1.33	1.09	0.95	1.23
	CV	17.50	18.88	13.66	22.60	18.32	26.25	18.55	15.97	18.23	18.81	20.57	15.94	23.24	23.33	20.76	24.17	21.68	19.61
MNW (mm)	$\bar{X}$	0.16	0.15	0.17	0.16	0.17	0.15	0.17	0.17	0.18	0.14	0.15	0.14	0.14	0.14	0.14	0.15	0.15	0.15
	CV	14.88	13.81	13.88	16.65	14.67	16.66	13.87	14.58	12.91	19.37	20.89	17.26	20.38	20.74	20.06	17.08	17.51	16.65
PMNW (mm)	$\bar{X}$	0.34	0.32	0.37	0.35	0.33	0.38	0.45	0.42	0.47	0.21	0.17	0.24	0.19	0.17	0.20	0.19	0.14	0.25
	CV	51.25	56.27	46.02	54.14	52.30	54.48	39.87	38.84	40.04	75.62	74.60	72.54	81.29	80.09	81.11	70.77	64.42	61.30
NW50 (mm)	$\bar{X}$	0.13	0.12	0.14	0.13	0.14	0.13	0.15	0.15	0.15	0.12	0.12	0.12	0.11	0.11	0.11	0.12	0.11	0.12
	CV	19.13	18.24	15.49	18.05	16.57	19.39	16.33	17.69	14.89	18.82	19.03	18.62	18.74	18.52	18.93	15.42	14.66	15.59
NW90 (mm)	$\bar{X}$	0.05	0.04	0.06	0.05	0.05	0.06	0.07	0.07	0.06	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04
	CV	37.87	34.42	29.74	31.46	35.24	27.08	24.86	21.61	27.47	42.97	41.35	43.00	49.97	47.28	52.31	40.39	39.41	35.86
NA10 (°)	$\bar{X}$	22.22	20.62	23.83	25.42	26.54	24.31	23.98	24.83	23.14	27.85	29.80	25.91	27.17	29.14	25.19	31.30	34.87	27.73
	CV	22.66	24.15	19.17	22.99	19.17	26.06	20.44	20.63	19.58	23.81	22.90	22.52	30.08	30.36	27.45	25.52	20.07	26.35
NA25 (°)	$\bar{X}$	9.76	8.71	10.82	11.56	11.96	11.16	11.46	11.91	11.00	12.01	12.94	11.08	11.68	12.64	10.73	14.12	15.88	12.36
	CV	27.46	29.89	21.48	27.04	21.89	31.56	23.04	22.92	22.46	26.39	25.11	25.25	37.07	37.24	34.38	30.36	24.93	31.30

On-line Suppl. Tab. 5. Descriptive statistics for analysed cone traits of *Juniperus oxycedrus* and *J. deltoides* from six studied populations, individually. $\bar{X}$ – arithmetic mean; CV – coefficient of variation (%). Cone morphometric traits acronyms: CL – cone length; CW – cone width; NCS – number of cone scales; NS – number of seeds; SL – seed length; SW – seed width; ST – seed thickness. Populations: P1 – Le Beaucet; P2 – Grand Vallat; P3 – Les Plantades; P4 – Cres; P5 – Krk; P6 – Pula.

Trait	Descriptive parameter	*J. oxycedrus*			*J. deltoides*		
		P1	P2	P3	P4	P5	P6
CL (mm)	$\bar{X}$	10.41	9.71	11.00	8.38	8.33	8.09
	CV	9.03	10.71	10.27	13.66	10.70	17.62
CW (mm)	M	10.15	10.11	11.15	9.49	9.16	9.25
	CV	11.42	10.97	10.26	11.59	13.36	14.61
NCS	$\bar{X}$	3.00	3.24	3.89	3.06	3.00	3.18
	CV	0.00	14.92	26.66	11.18	0.00	21.09
NS	$\bar{X}$	2.68	2.89	2.93	2.80	2.62	2.76
	CV	46.50	22.96	15.95	17.17	22.86	21.06
SL (mm)	$\bar{X}$	7.42	7.12	7.61	6.63	6.08	5.76
	CV	11.41	10.55	8.32	13.06	12.89	13.06
SW (mm)	$\bar{X}$	5.25	4.35	4.71	3.66	3.40	3.35
	CV	17.22	15.55	16.24	14.70	19.75	22.64
ST (mm)	$\bar{X}$	3.92	3.47	3.49	3.05	2.95	2.66
	CV	21.69	15.84	13.12	14.25	20.36	19.13

On-line Suppl. Tab. 6. Results of the General Linear Model (GLM) for needle traits. Needle morphometric traits acronyms: NA – needle area; NL – needle length; MNW – maximum needle width; PMNW – needle length, measured from the needle base to the point of maximum needle width; NW50 – needle width at 50% of needle length; NW90 – needle width at 90% of needle length; NA10 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 10% of total needle length; NA25 – angle closed by the main needle vein and the line connecting the needle base to a set point on the needle margin at 25% of total needle length. Pop – population; T1 – *J. oxycedrus*; T2 – *J. deltoides*. Populations: P1 – Le Beaucet; P2 – Grand Vallat; P3 – Les Plantades; P4 – Cres; P5 – Krk; P6 – Pula. df – degrees of freedom; F – F-test in GLM; P – significance of GLM's F-test: n.s. – not significant at $P > 0.05$; * – $0.01 < P < 0.05$; ** – $0.001 < P < 0.01$; *** – $P < 0.001$.

Components of the variance		NA		NL		MNW		PMNW		NW50		NW90		NA10		NA25	
Sex (Taxon)	df	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P
Taxon T1	5	3.05	*	3.69	**	5.25	***	6.57	***	10.82	***	11.89	***	2.82	*	3.58	**
Taxon T2	5	2.22	n.s.	3.95	**	0.69	n.s.	3.65	**	0.78	n.s.	2.24	n.s.	8.81	***	8.54	***
Population × Sex (Taxon)	df	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P
Population P1 Taxon T1	1	0.85	n.s.	3.36	n.s.	7.13	**	2.57	n.s.	20.81	***	17.99	***	3.75	n.s.	5.67	*
Population P2 Taxon T1	1	0.65	n.s.	0	n.s.	8.83	**	2.76	n.s.	0.85	n.s.	1.67	n.s.	1.81	n.s.	0.82	n.s.
Population P3 Taxon T1	1	6.77	*	4.92	*	1.14	n.s.	2.3	n.s.	0.3	n.s.	1.75	n.s.	1.03	n.s.	1.05	n.s.
Population P4 Taxon T2	1	0.49	n.s.	1.55	n.s.	1.05	n.s.	4.05	*	0.07	n.s.	1.1	n.s.	5.5	*	4.43	*
Population P5 Taxon T2	1	2.76	n.s.	4.16	*	0.01	n.s.	1	n.s.	0.23	n.s.	0.08	n.s.	5.69	*	4.69	*
Population P6 Taxon T2	1	6.58	*	8.86	**	0.03	n.s.	12.57	***	1.71	n.s.	5.6	*	18.55	***	15.75	***
Population (Taxon)	df	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P
Taxon T1	2	3.5	*	5.09	**	4.57	*	12.61	***	16.07	***	19.02	***	3.74	*	5.19	**
Taxon T2	2	0.64	n.s.	2.6	n.s.	1.18	n.s.	0.32	n.s.	0.95	n.s.	2.21	n.s.	7.14	**	8.91	***

On-line Suppl. Tab. 7. Results of the General Linear Model (GLM) for cone traits on taxon level. Cone morphometric traits acronyms: CL – cone length; CW – cone width; NCS – number of cone scales; NS – number of seeds; SL – seed length; SW – seed width; ST – seed thickness. T1 – *J. oxycedrus*; T2 – *J. deltoides*. df – degrees of freedom; F – F-test in GLM; P – significance of GLM's F-test: n.s. – not significant at $P > 0.05$; * – $0.01 < P < 0.05$; ** – $0.001 < P < 0.01$; *** – $P < 0.001$.

Trait	Population (Taxon)	df	F	P
CL	Taxon T1	2	4.62	*
	Taxon T2	2	0.28	n.s.
CW	Taxon T1	2	3.17	*
	Taxon T2	2	0.27	n.s.
NCS	Taxon T1	2	26.03	***
	Taxon T2	2	1.05	n.s.
NS	Taxon T1	2	0.82	n.s.
	Taxon T2	2	0.35	n.s.
SL	Taxon T1	2	1.87	n.s.
	Taxon T2	2	6.18	**
SW	Taxon T1	2	8.72	***
	Taxon T2	2	1.21	n.s.
ST	Taxon T1	2	2.84	n.s.
	Taxon T2	2	1.9	n.s.