Supplementary material

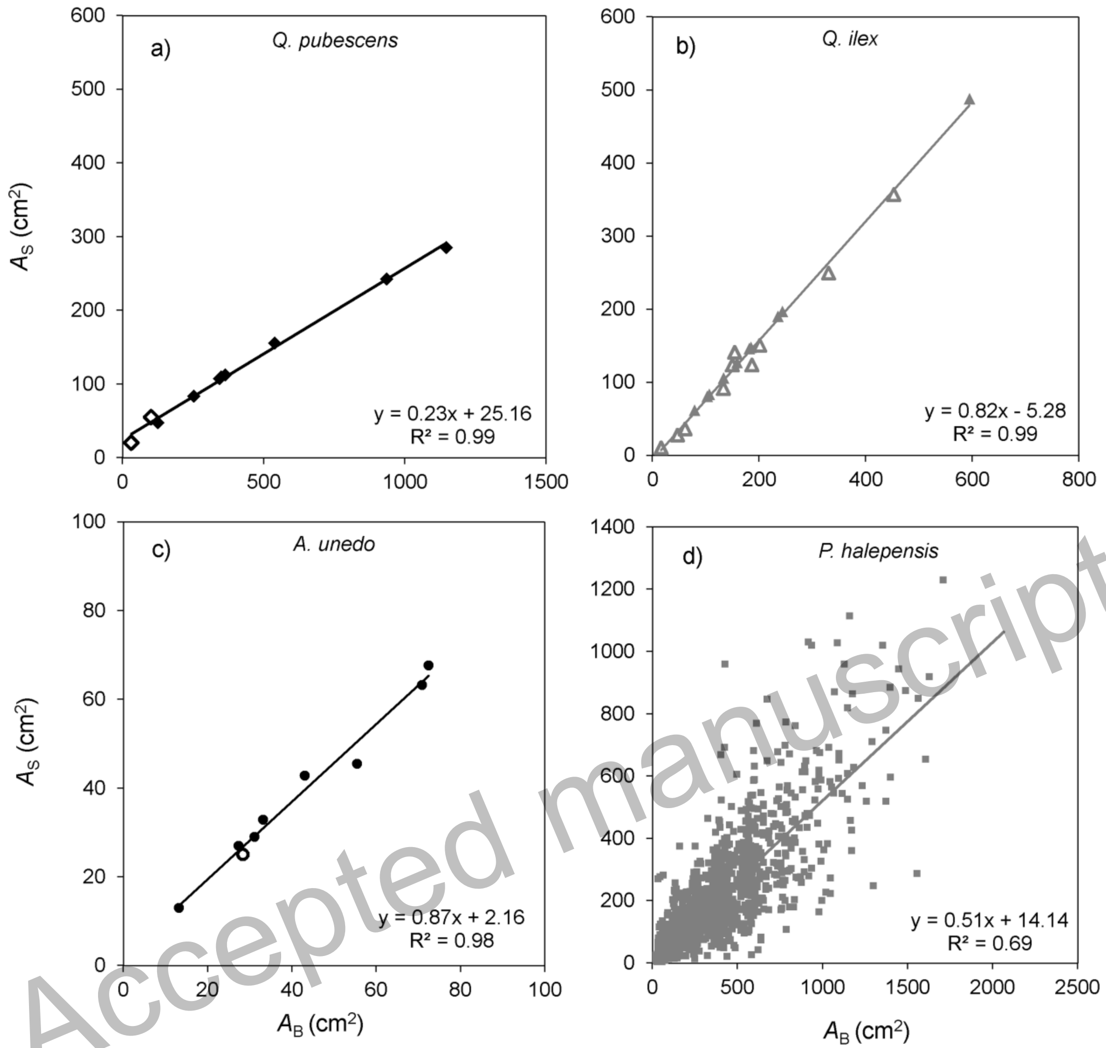

Figure S1. Relationship between sapwood area (A_S) and stem basal area (A_B) for each species: (a) *Q. pubescens* (black diamond and black solid line), (b) *Q. ilex* (grey triangle and grey solid line), (c) *A. unedo* (black circle and black short dash line) and (d) *P. halepensis* (grey square and grey short dash line). Closed symbols depict actual A_S measurements in the studied species within the same region taken from the literature or from the Ecological and Forest Inventory of Catalonia (IEFC) in the case of *P. halepensis*. Regression lines are fitted to these data. Open symbols represent field measurements in a nearby location and they are shown for validation purposes (see Materials and Methods). Note the different scales in the x- and y-axes.

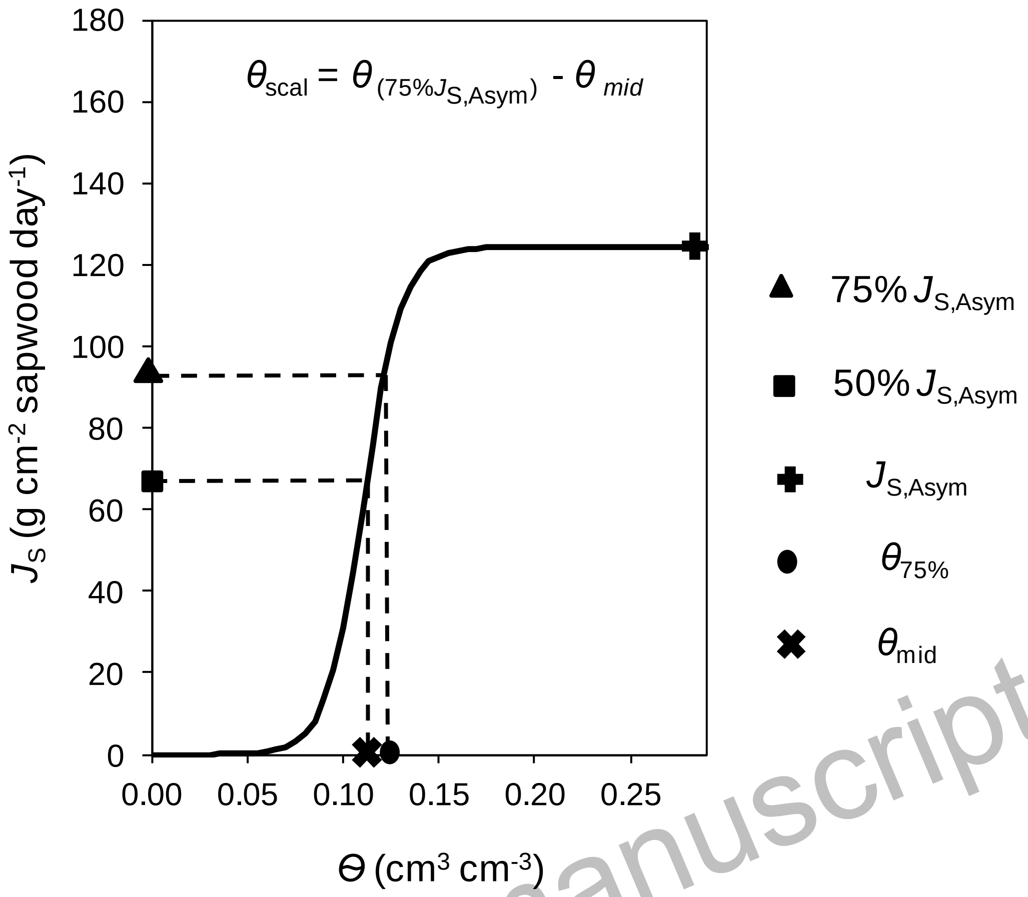

Figure S2. Representation of the response of sapflow per unit sapwood are (J_S) to volumetric soil water availability (θ) using a three-parameter sigmoid function. 75 % of $J_{S,Asym}$ (triangle), 50 % of $J_{S,Asym}$ (square), $J_{S,Asym}$ (cross), $\theta_{75\%}$ (circle) and θ_{mid} ("x"). The value of θ_{mid} is the value of θ where J_S is 50 % of $J_{S,Asym}$. The value of θ_{scal} represents the difference between θ_{mid} and the value of θ at which J_S is 75 % of $J_{S,Asym}$.

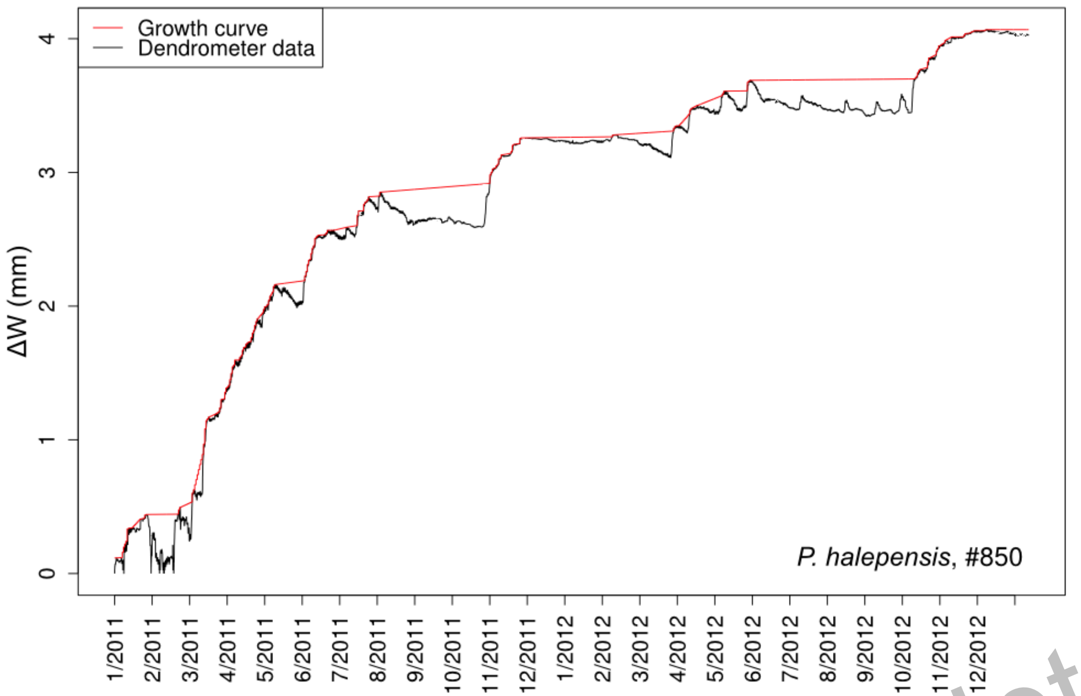

Figure S3. Example of tree water deficit (ΔW) calculation, showing the reference growth curve (red) and the actual dendrometer data (black) from an individual of *P. halepensis* levelled as number 850. Labels on the x axis represent time in month/year format (i.e. January 2011 is 1/2011).

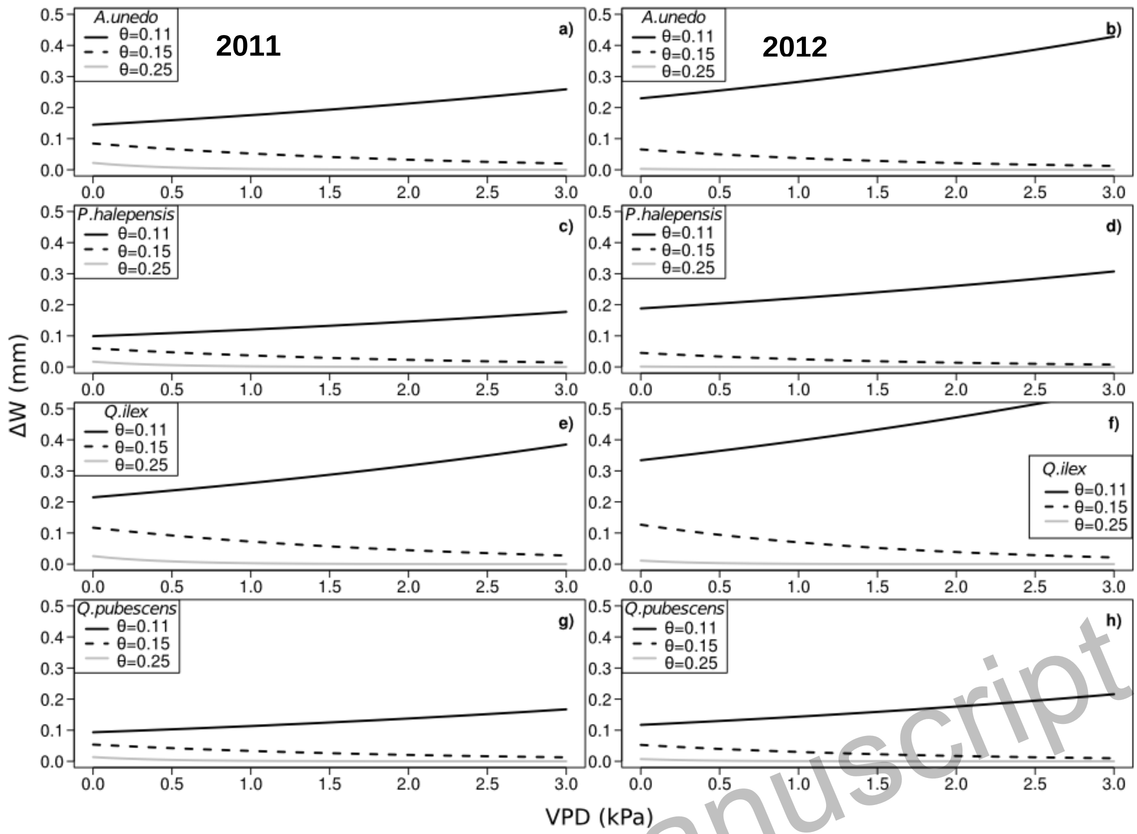

Figure S4. Modelled responses of tree water deficit (ΔW) to vapour pressure deficit (VPD) at different values of volumetric soil water availability (θ) (0.075, 0.15 and 0.25 cm^3 cm^{-3}) for each species, according to model in Table 3. Panels on the left column depict results for 2011 and panels on the right, for 2012.

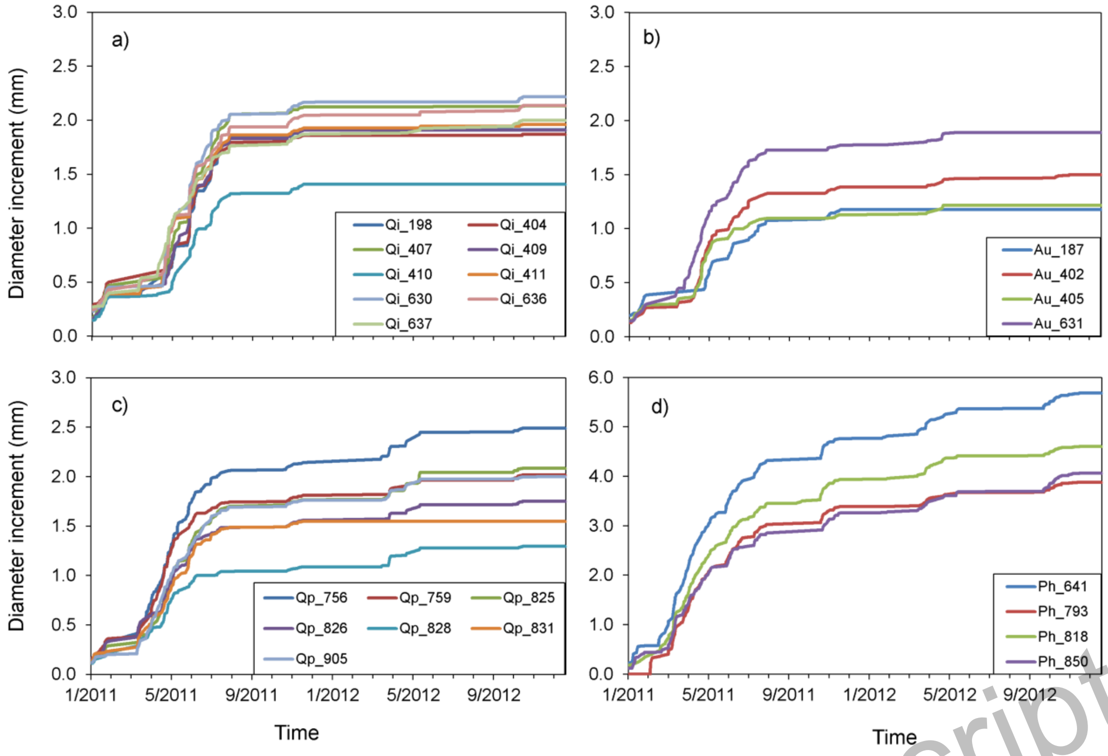

Figure S5. Reference growth curves used to calculate tree water deficit (ΔW) for each of the measured trees, separated by species: (a) *Q. ilex*, (b) A. *unedo*, (c) *Q.pubescens* and (d) *P. halepensis*. Labels on the x axis represent time in month/year format (i.e. January 2011 is 1/2011). Note the different scale in the y-axis for *P. halepensis*.

Table S1. Parameter values of the allometric equations extracted from IEFC (Gracia et al. 2004) relating total aboveground biomass (AGB) (kg) with diameter at breast height (DBH) (cm). Data from biomass carbon concentration (CC) (g C/100g biomass) for each aerial tree fraction also are shown. Annual aboveground carbon production (AGC, kg C year^{-1}) presented on Table 3 was calculated following the equation $\mathrm{AGC} = \mathrm{Mean\ CC} \cdot \frac{\Delta \mathrm{AGB}}{100}$, where ΔAGB is the total aboveground biomass increment for a given year and Mean CC is carbon concentration averaged across all aerial fractions.

	Parameter	*Q. ilex*	*Q. pubescens*	*A. unedo*	*P. halepensis*
$\mathrm{AGB} = \mathrm{a} \cdot \mathrm{DBH}^{\mathrm{b}}$	a	0.16	0.11	0.15	0.12
	b	2.27	2.35	2.26	2.22
	n	722	280	9	1387
	R^2	0.94	0.95	0.86	0.92
CC (g/100g)	Wood	47.53	48.41	NA (50)	49.87
	Bark	46.76	47.06	NA (50)	52.30
	Leaves	50.26	48.74	NA (50)	52.96
	Branchs	48.17	48.20	NA (50)	50.40

Table S2. Summary of the linear mixed models for sap flow density (J_S) and sap flow per tree (J_T) for each species and different periods of the year 2011 and 2012. Different letter represents statistically significant differences between species for a given season and year. Bold numbers represent statistically significant differences between years for a given season and species. Significance level is accepted at P<0.05.

			Q. ilex	*Q. pubescens*	*A. unedo*	*P. halepensis*
J_S (g cm^{-2}day^{-1})	Winter	2011	47.38 ± 6.34^{a}	18.09 ± 3.33^{b}	30.63 ± 4.70^{b}	17.74 ± 3.50^{b}
		2012	56.22 ± 7.98^{a}	17.47 ± 5.82^{b}	31.51 ± 6.52^{b}	16.42 ± 4.32^{b}
	Spring	2011	60.71 ± 6.92^{ab}	**85.36 ± 13.52^{b}**	53.09 ± 9.95^{ab}	**32.00 ± 4.78^{a}**
		2012	74.14 ± 9.37^{a}	**60.80 ± 4.60^{a}**	48.34 ± 10.50^{ab}	**16.25 ± 5.34^{b}**
	Summer	2011	43.82 ± 4.97^{a}	**75.68 ± 12.05^{b}**	40.22 ± 8.61^{a}	**19.44 ± 3.42^{a}**
		2012	37.58 ± 5.16^{ab}	**50.40 ± 6.26^{a}**	22.46 ± 9.95^{bc}	**4.93 ± 0.37^{c}**
	Autumn	2011	32.70 ± 4.87^{a}	30.07 ± 3.69^{ab}	21.31 ± 4.61^{ab}	16.58 ± 3.41^{b}
		2012	38.06 ± 6.07^{a}	31.24 ± 5.96^{ab}	18.41 ± 5.87^{ab}	11.89 ± 1.64^{b}
J_T (kg day^{-1})	Winter	2011	11.95 ± 3.39^{a}	1.21 ± 0.18^{b}	5.37 ± 1.04^{b}	7.04 ± 1.41^{ab}
		2012	14.20 ± 3.86^{a}	1.00 ± 0.24^{b}	5.72 ± 1.47^{ab}	6.14 ± 2.36^{ab}
	Spring	2011	16.07 ± 3.23^{a}	**6.06 ± 1.22^{b}**	9.32 ± 2.13^{ab}	**12.64 ± 1.84^{ab}**
		2012	17.91 ± 3.94^{a}	**3.95 ± 0.61^{b}**	8.77 ± 2.32^{ab}	**6.08 ± 2.37^{b}**
	Summer	2011	11.57 ± 2.30^{a}	**5.40 ± 1.13^{b}**	7.07 ± 1.83^{ab}	**7.71 ± 1.38^{ab}**
		2012	8.50 ± 1.51^{a}	**3.20 ± 0.34^{b}**	4.13 ± 1.77^{b}	**1.79 ± 0.01^{b}**
	Autumn	2011	8.74 ± 2.03^{a}	2.07 ± 0.29^{b}	3.77 ± 1.01^{b}	6.59 ± 1.38^{ab}
		2012	8.85 ± 2.13^{a}	1.92 ± 0.21^{b}	3.37 ± 1.24^{b}	4.39 ± 0.91^{ab}

Table S3. Main structural characteristics and estimated growth/transpiration data of trees monitored with sap flow sensors and dendrometers for 2011 and 2012. Abbreviations: A_B: basal area; A_S: sapwood basal area; A_L: total leaf area; BAI: basal area increment; J_T: whole-tree transpiration; WUE_{BAI}: growth-based water use efficiency.

Tree ID	Specie	Year	DBH (cm)	Height (m)	A_B (cm^2)	A_S (cm^2)	A_L (m^2)	BAI (cm^2 $year^{-1}$)	J_T ($m^3 \cdot year^{-1}$)	WUE_{BAI} (cm^2 m^{-3})
638	*Q. ilex*	2011	13.5	9.5	143.1	109.1	30.1	-	1.3	-
		2012	-	-	-	-	-	-	1.8	-
636	*Q. ilex*	2011	24.5	12.9	471.4	391.7	45.9	11.9	5.8	2.1
		2012	24.8	-	483.3	402.3	46.4	1.6	5.5	0.3
404	*Q. ilex*	2011	19.4	10.0	295.6	237.5	34.1	9.5	2.9	3.3
		2012	19.7	-	305.1	245.6	34.6	0.5	2.8	0.2
410	*Q. ilex*	2011	20.6	10.6	333.3	270.1	26.7	5.3	1.7	3.1
		2012	20.8	-	338.6	274.7	27.0	0.0	-	-
198	*Q. ilex*	2011	22.1	8.9	383.6	314.0	43.5	10.3	5.6	1.8
		2012	22.4	-	393.9	323.1	44.0	0.0	-	-
411	*Q. ilex*	2011	22.4	10.9	394.1	323.2	29.2	10.8	6.2	1.7
		2012	22.7	-	404.9	332.8	29.7	0.6	7.0	0.1
637	*Q. ilex*	2011	16.3	8.4	208.7	163.5	26.0	10.0	3.0	3.3
		2012	16.7	-	218.7	171.9	26.6	1.7	3.7	0.5
756	*Q. pubescens*	2011	18.2	9.8	260.2	92.8	46.2	13.5	1.8	7.5
		2012	18.7	-	273.7	96.2	47.1	5.4	1.1	4.9
826	*Q. pubescens*	2011	16.9	11.2	224.3	83.5	26.6	6.9	1.0	6.9
		2012	17.2	-	231.2	85.3	27.1	2.3	-	-

753	*Q. pubescens*	2011	12.3	9.3	118.8	53.1	25.4	-	1.0	-
		2012	-	-	-	-	-	-	0.7	-
759	*Q. pubescens*	2011	18.0	8.6	254.5	91.3	28.4	9.6	2.4	4.0
		2012	18.3	-	264.1	93.7	28.9	2.8	-	-
828	*Q. pubescens*	2011	11.8	8.8	109.4	50.1	24.7	3.4	1.3	2.6
		2012	12.0	-	112.8	51.2	25.0	1.7	0.9	1.9
831	*Q. pubescens*	2011	14.3	10.1	160.6	65.8	23.3	7.2	1.3	5.5
		2012	-	-	-	-	-	-	0.7	-
905	*Q. pubescens*	2011	12.0	9.1	113.1	51.3	20.7	9.4	0.4	23.5
		2012	12.5	-	122.5	54.3	21.5	3.0	-	-
405	*A. unedo*	2011	17.2	8.5	231.0	197.8	22.2	3.6	3.3	1.1
		2012	17.3	-	234.6	200.7	22.4	0.6	3.0	0.2
402	*A. unedo*	2011	14.8	6.7	170.9	148.6	6.5	5.7	1.0	5.7
		2012	15.0	-	176.6	153.3	6.9	1.1	-	-
187	*A. unedo*	2011	15.2	8.3	180.3	156.4	47.0	3.8	2.2	1.7
		2012	15.3	-	184.1	159.5	47.1	0.1	1.5	0.1
631	*A. unedo*	2011	16.5	9.0	213.8	183.8	26.5	9.4	1.7	5.5
		2012	16.9	-	223.2	191.4	27.1	1.4	1.1	1.2
818	*P. halepensis*	2011	33.3	17.4	870.9	391.6	55.3	50.8	3.7	13.7
		2012	34.3	-	921.7	411.4	56.9	17.9	2.0	9.1
793	*P. halepensis*	2011	30.7	17.6	740.2	339.9	49.6	35.2	2.0	17.6
		2012	31.4	-	775.4	353.9	50.7	11.6	1.0	11.2
850	*P. halepensis*	2011	36.7	16.2	1057.8	463.8	62.3	32.6	2.6	12.5
		2012	37.3	-	1090.4	476.2	63.3	18.4	-	-