Title: Evidence for climate-driven synchrony of marine and terrestrial ecosystems in northwest Australia

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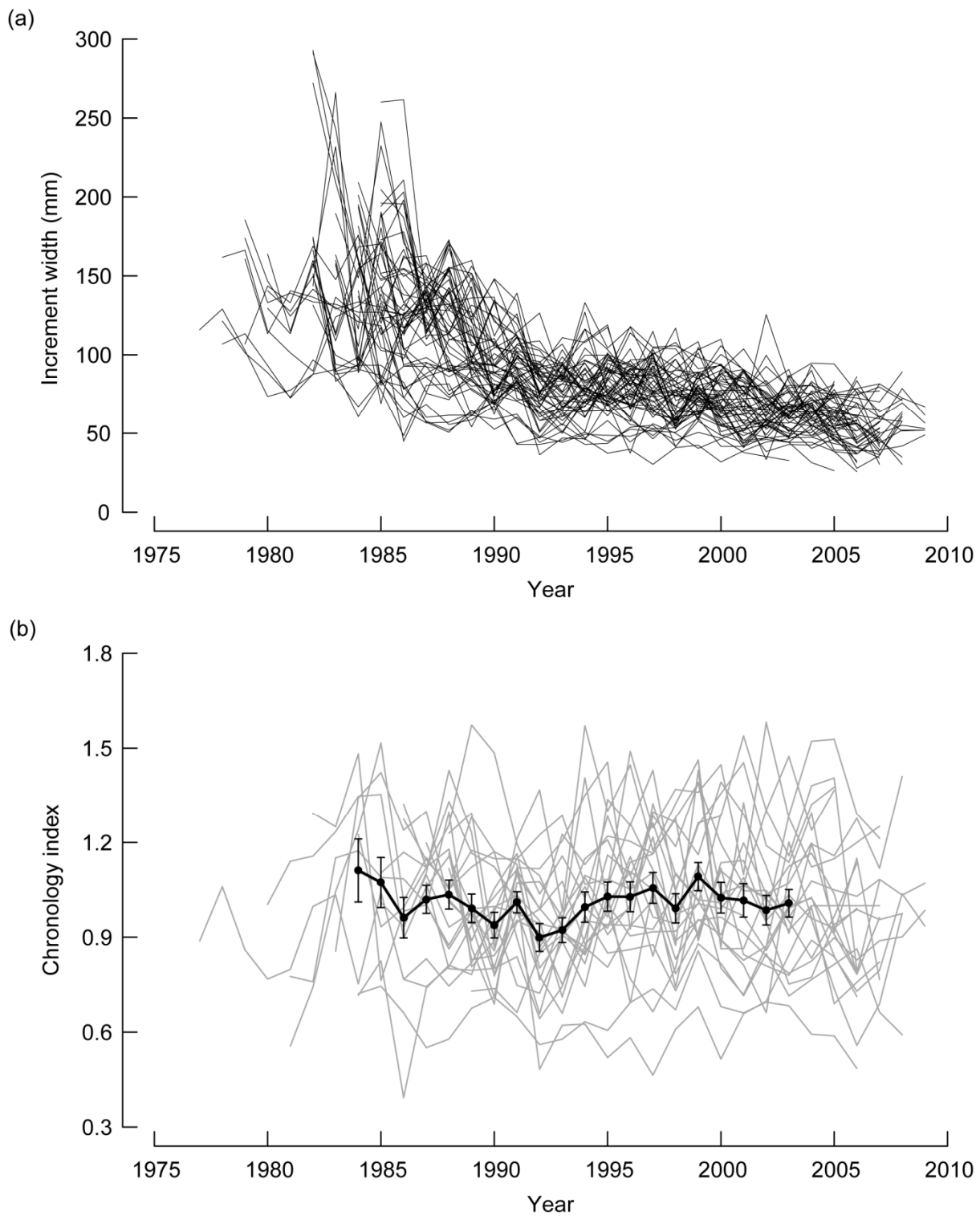
Supplementary Fig. S1 Raw and detrended increment width time series from the otoliths of *Lethrinus nebulosus* collected in northwest Australia: (a) raw increment width time series from all transects of the 23 fish used and (b) detrended increment width time series and the final chronology (in black) with the associated standard error of mean.
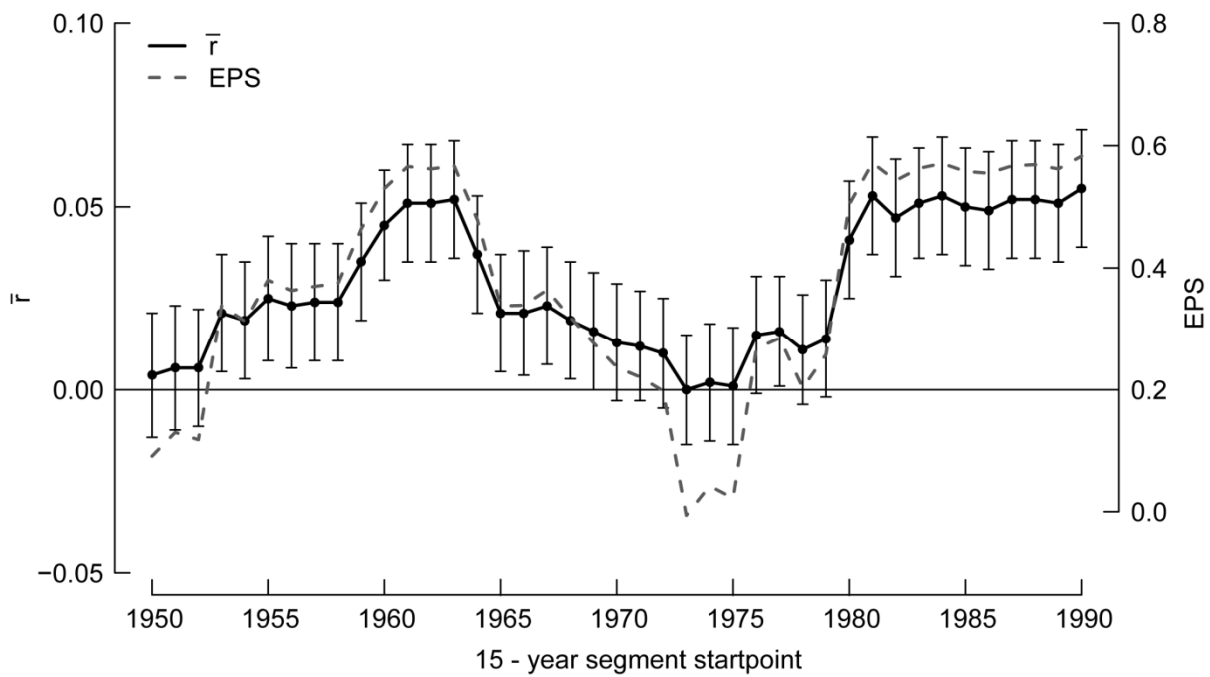
Supplementary Fig. S2 Bootstrapped $\bar{r}$ (with 95% confidence intervals) and expressed population signal (EPS) for the 24 coral cores of *Porites* spp. collected in northwest Australia from 2008 to 2010. These values were calculated using a running window length of 15 years with an overlap of 14 years and shows that there was a synchronous signal among the corals for the year 1980 onwards.

Supplementary Table S1 Growth chronologies of fishes, corals and trees from northwest Australia.

Species	Type of Data	Length of chronology	Location (sample size)	Source
Fish (*Lutjanus argentimaculatus*)	Annual growth increments from otoliths	1975-2003	Kimberley (15) Pilbara (15) Gascoyne (6)	Ong *et al.*, 2015
Fish (*Lethrinus nebulosus*)	Annual growth increments from otoliths	1984-2003	Gascoyne coast (23)	This study
Coral (*Porites* spp.)	Annual calcification rate from coral cores	1900-2010	Clerke Reef (5) Imperieuse Reef (4) Bundegi (4) Tantabiddi (7) Coral Bay (4)	Cooper *et al.*, 2012
Tree (*Callitris columellaris*)	Ring-width chronology	1802-2012	Hamersley Range, inland Pilbara (27)	O'Donnell *et al.*, 2015

Supplementary Table S2 Pearson's correlation matrix of the growth chronologies of four biological variables (two fishes, one coral and one tree) in northwest Australia. The four taxa are *Lutjanus argentimaculatus*, *Lethrinus nebulosus*, *Porites* spp. and *Callitris columellaris*, respectively. The growth chronologies span from the year 1984 to 2003.

Taxa	*L. nebulosus*	*Porites* spp.	*C. columellaris*
L. argentimaculatus (fish)	0.28	0.38	0.22
L. nebulosus (fish)	-	<0.1	0.50
Porites spp. (coral)	<0.1	-	<0.1
C. columellaris (tree)	0.50	<0.1	-

Supplementary Table S3 Loadings of the four taxa (two fishes, one coral and one tree) on the first and second principal components (PC). Chronologies included the years 1984 to 2003.

Taxa	Loading on PC1	Loading on PC2
Fish (*Lethrinus nebulosus*)	-0.60	+0.29
Tree (*Callitris columellaris*)	-0.58	+0.31
Fish (*Lutjanus argentimaculatus*)	-0.54	-0.47
Coral (*Porites* spp.)	-0.13	-0.78

Supplementary Table S4 Pearson's correlation matrix of the six environmental variables from a grid covering the northwest Australian coast (14°S - 28°S, 110°E - 127°E). Each environmental variable consist of January to March averages from the years 1984 to 2003. SST = Sea Surface Temperature, SSS = Sea Surface Salinity, lag = data with a one year lag.

Environmental variables	SST lag	SSS	SSS lag	Rainfall	Rainfall lag
SST	0.4	<0.1	<0.1	0.2	0.4
SST lag	-	-0.6	<0.1	0.5	0.2
SSS	<0.1	-	0.5	-0.4	-0.4
SSS lag	<0.1	0.5	-	-0.2	-0.4
Rainfall	0.5	-0.4	-0.2	-	<0.1
Rainfall lag	0.2	-0.4	-0.4	<0.1	-

Supplementary Table S5 Selected models with a maximum of two non-collinear explanatory variables that went into the model selection process. Explanatory variables consist of January to March averages from the years 1984 to 2003. Response variables are the first two principal components (PC) scores from four taxa (two fishes, one coral and one tree) in northwest Australia. ΔAICc = difference in second order Akaike information criterion, SST = Sea Surface Temperature, SSS = Sea Surface Salinity, lag = data with a one year lag. Model 1 shows the first ranked model for PC1 and model 2 is the first ranked model for PC2.

Model	Explanatory variables	ΔAICc for PC1	ΔAICc for PC2
1	SST + Rainfall	0.00	13.40
2	Rainfall + SSS	11.89	0.00
3	SST + SSS	17.67	3.80
4	Rainfall + SSS lag	11.47	12.30
5	SST lag + SSS lag	12.99	9.10
6	SST lag + Rainfall lag	13.00	9.60
7	SST + SSS lag	17.67	12.50
8	SST + Rainfall lag	17.13	13.50
9	SSS lag + Rainfall lag	24.97	10.00
10	Rainfall + Rainfall lag	11.82	13.50
11	SSS	21.81	1.50
12	Rainfall	8.75	10.48
13	SST	14.56	10.42
14	SSS lag	23.22	9.52
15	Rainfall lag	23.00	10.48
16	SST lag	9.84	7.13
17	Intercept only	20.43	7.86