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Corrigendum

Corrigendum to "Influence of climate change and pesticide use practices on the ecological risks of pesticides in a protected Mediterranean wetland: A Bayesian network approach" [Sci. Total Environ. Volume 878 (2023), 163018]

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The authors express regret regarding the presence of errors in the printed version of the aforementioned article. The exposure assessment and risk assessment were based on forecasted precipitation values for the 2008, 2050 and 2100 scenarios that were not correct. The correct precipitation values for the 2008, 2050 and 2100 scenarios during the crop production season are 111, 64 and 57 mm, respectively. The version below shows the re-calculated exposure concentration distributions and the re-calculated risk distributions based on Bayesian networks, together with any modifications in the discussion. However, it should be noted that the corrections made here do not alter the overall conclusions of the study. The authors sincerely apologize for any inconvenience caused.

3. Results and discussion

Pesticide exposure assessment

The three climate scenarios were significantly different, both in terms of daily mean temperature and total precipitation for the whole crop season (Fig. 4). The mean daily temperature (±SD) was 22 ± 4 °C for 2008, 24 ± 5 °C for 2050 and 28 ± 4 °C for 2100. Regarding the precipitation values during crop season, they amounted to 111 mm for 2008, 64 mm for 2050, and 57 mm for 2100. The results of the exposure assessment show that the different weather projections for 2008, 2050 and 2100 notably affected pesticide exposure distributions (Fig. 5). For most pesticides, the increase in temperatures and the reduction in precipitation of the 2050 and 2100 scenarios resulted in a decrease of predicted exposure concentrations, which in general was more evident for the PEC distributions as compared to the TWAC ones. However, for other pesticides such as acetamiprid or imazamox, the exposure distributions in the different time horizons were rather comparable, while propanil showed higher PEC and TWAC distributions in 2050 as compared to 2008 and 2100 due to precipitation peaks during the time of pesticide application (see Figs. 5 and S3).

The observed trend towards a reduction of PEC and TWACs for most pesticides in the 2050 and 2100 scenarios could be related to processes such as volatilization (Bloomfield et al., 2006; Noyes et al., 2009) and microbial biodegradation in water or sediment (Delcour et al., 2015). These processes were enhanced by increasing temperatures as described in the equations that support the RICEWQ calculations. For compounds such as acetamiprid or imazamox, the slight differences in PEC or TWACs among the three environmental scenarios could be related to their application type and their specific physico-chemical properties. For example, imazamox is applied directly to dried soils and shows a very low degradation rate in soil, therefore temperature is expected to affect much less this process. Acetamiprid, is also applied directly to soil during the 7-day dry period (i.e., the *eixugó* period). For both pesticides, PECs were driven by soil resuspension after rewetting, a process that is related to agricultural irrigation practices. As for propanil, the higher

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water concentration predicted for the 2050 scenario is closely related to heavy precipitation events occurring during or shortly after the pesticide application date (around D46), which influenced pesticide wash-off from the rice plants and sediment resuspension. In line with this, some studies, such as Nolan et al. (2008) or Lewan et al. (2009) indicate the timing of precipitation events in relation to pesticide application dates and drainage losses as one of the main drivers of peak exposure concentrations in water bodies.

Regardless of the climatic projections, variations in pesticide application dosages resulted in marked PEC and TWAC distribution differences as compared to the recommended dosages (Fig. 5). Differences in exposure distributions resulting from the different dosage scenarios were particularly noticeable for PECs of the fungicides azoxystrobin and difenoconazole, which are applied in periods in which the paddy fields were flooded, so that a fraction of the applied dosage is directly dissolved into the rice plot water. Notably, variations in pesticide contamination in paddy field water related to the different application scenarios tested in this study were more prominent than variations in pesticide exposure related to the 2050 and 2100 weather projections provided by the RCP 8.5 emission scenario. This suggests that, within this century, pesticide use management is likely more important than climate change factors to determine environmental exposure.

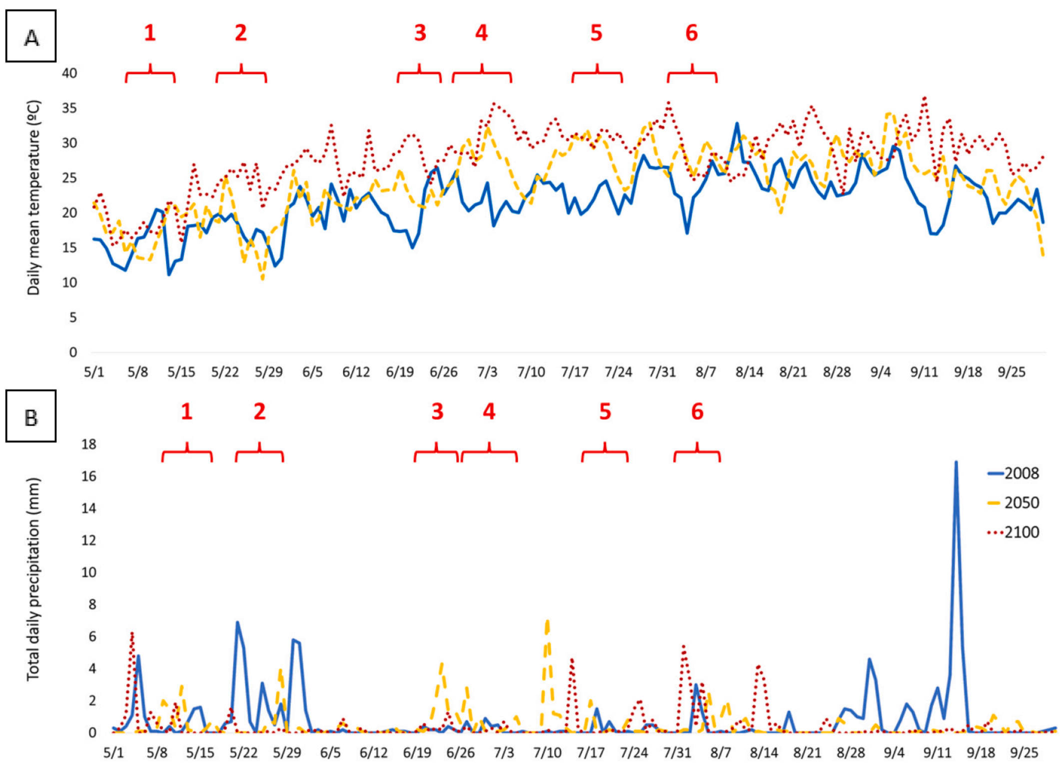
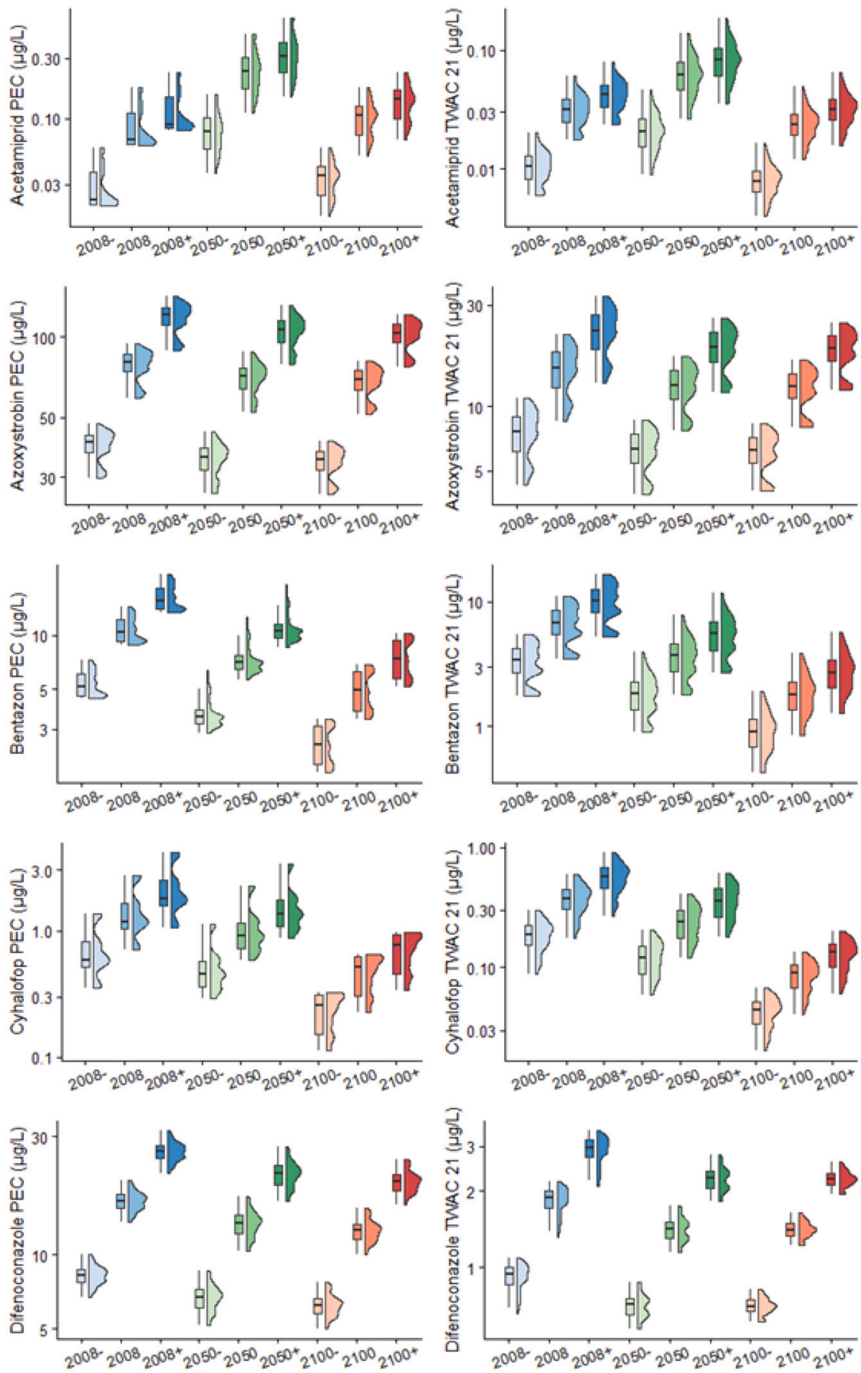


Fig. 4. (corrected). Variation of mean daily temperature (A) and total daily precipitation (B) over the rice cultivation period. Each line represents a different climate scenario (i.e., 2008, 2050, 2100) predicted by the MPI-ESM-LR model. The red numbers indicate pesticide application events: 1: cyhalofop (1st) (D7); 2: cyhalofop (2nd) and penoxsulam (D20); 3: propanil (D46); 4: acetamiprid, bentazon, imazamox and MCPA (D56); 5: azoxystrobin and difenoconazole (1st); 6: azoxystrobin and difenoconazole (2nd). See Fig. 1 for a detailed description of the pesticide dosages and modes of application.


Acetamiprid PEC (µg/L)
Acetamiprid TWAC 21 (µg/L)
Azoxystrobin PEC (µg/L)
Azoxystrobin TWAC 21 (µg/L)
Bentazon PEC (µg/L)
Bentazon TWAC 21 (µg/L)
Cyhalofop PEC (µg/L)
Cyhalofop TWAC 21 (µg/L)
Difenoconazole PEC (µg/L)
Difenoconazole TWAC 21 (µg/L)
2008- 2008 2008+ 2050- 2050 2050+ 2100- 2100 2100+

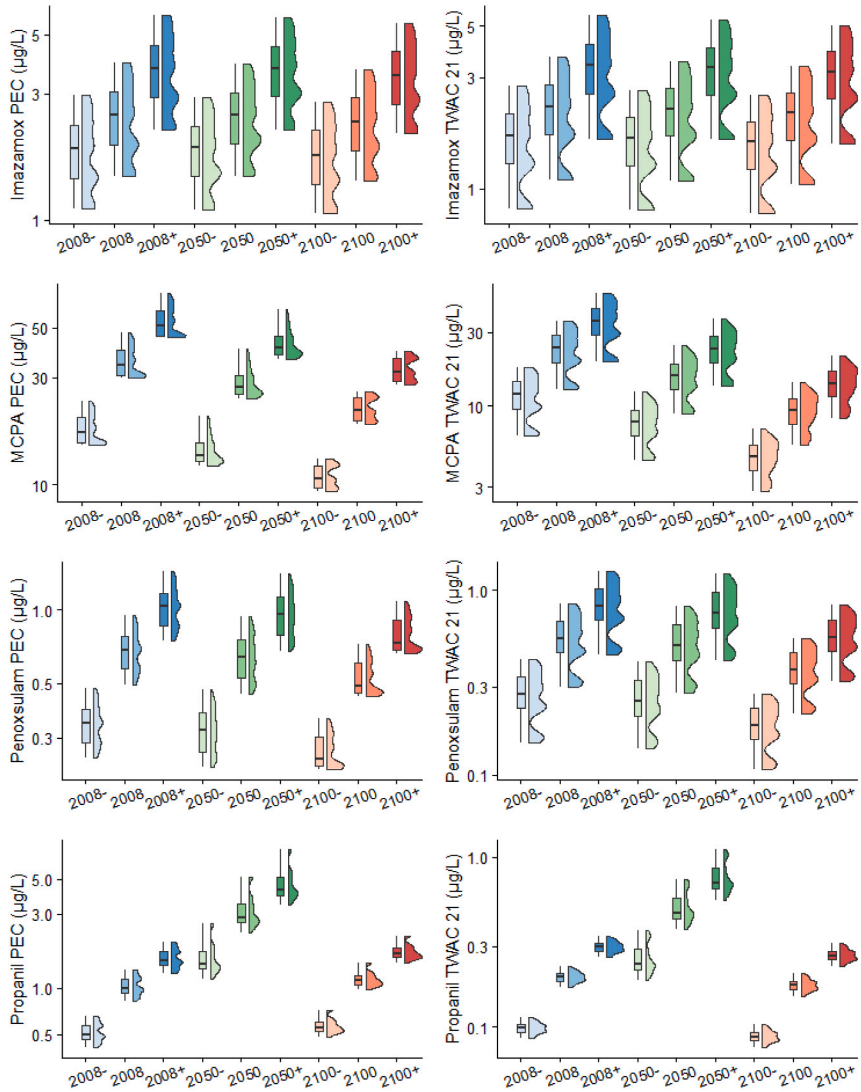


Fig. 5. (corrected). Peak exposure concentration (PEC) and highest time weighted average concentration (TWAC) distributions for the nine pesticides evaluated in this study within each scenario. The box plot shows the median of the distribution (bold line) as well as the 25th and 75th percentiles. See Table 1 for a description of the pesticide scenario abbreviations.

Ecological risk assessment

The Bayesian network approach predicted acute and chronic RQ distributions as the ratio between the exposure distributions and the SSDs (Fig. 6). For most pesticides, the percentage of rice clusters with moderate or high acute risks in the baseline scenario was relatively low (<5 %). Exceptions were the fungicides azoxystrobin and difenoconazole, with a probability of 28 % and 6 % of the rice clusters showing a moderate risk for the 2008 scenarios. Regarding chronic risks, for the baseline scenario, the following compounds showed significant moderate and high risks (>5 % of rice clusters): azoxystrobin (56 %), MCPA (12 %) and difenoconazole (6 %, Fig. 6).

The different climate projections (2050 and 2100) had a mild influence on the RQ distributions, despite the decrease in exposure concentrations described for some compounds in the previous section. One of the most striking influences was observed in the chronic distribution of MCPA, which shifted from a 12 % probability of moderate or high risk in rice clusters during the 2008 scenario to 8 % in the 2050 scenarios and 3 % in the 2100 scenario. Conversely, a contrasting trend was observed in the chronic distribution of azoxystrobin, with almost unnoticeable changes in the probability of rice clusters with moderate or high risks: 56 % in 2008, 52 % in 2050, and 55 % in the 2100 scenario (Fig. 6).

The different pesticide dosage scenarios had a clear influence on the RQ distributions for the pesticides, particularly for those showing moderate and high risks in the 2008 scenario. For example, the percentage of rice production clusters showing moderate or high chronic risks for azoxystrobin in the scenario accounting for a reduction of 50 % of the dosage in the baseline scenario (i.e., 2008-) were 30 %, while the percentage in the scenario simulating a 50 % increase of the dose (i.e., 2008+) doubled to 60 %. In line with the mild influence of the weather scenarios described above, the temporal changes in the RQ distribution of scenarios assuming a 50 % increase or decrease in the dosages was relatively low (Fig. 6).

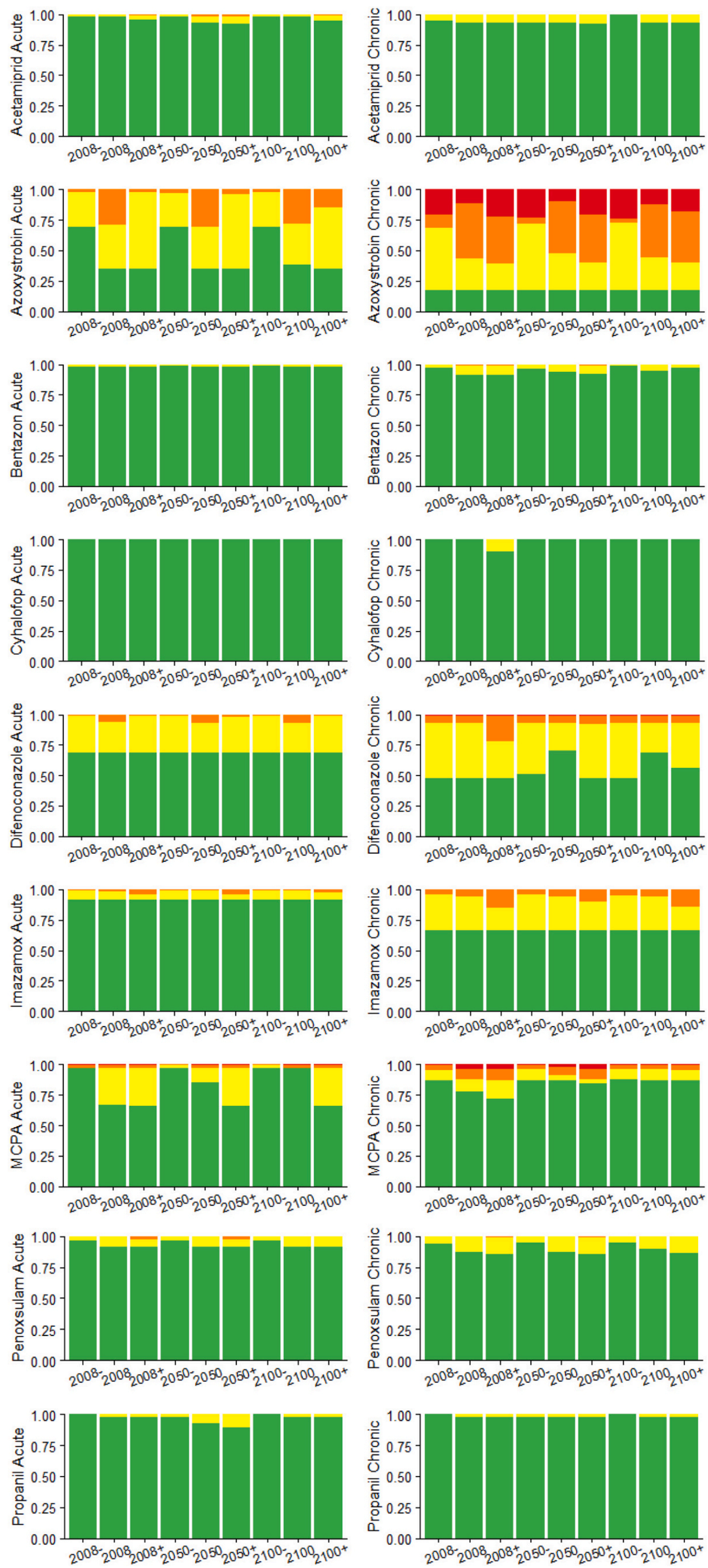


Fig. 6. Bar plots showing the fraction of acute and chronic risk quotients (RQs) for the different rice production clusters falling within each risk category. The colors indicate the risk categories: green: no risk (RQs: 0–0.1); yellow: potential risk (RQs: 0.1–1); orange: moderate risk (RQs: 1–10); red: high risk (RQs: 10–10,000). See Table 1 for a description of the pesticide scenario abbreviations.

Implications for risk assessment and way forward

This study shows how weather projections and environmental management strategies can be integrated into a probabilistic framework to characterize current and future risks of pesticides in a Mediterranean wetland of high ecological value. The approach allows integration of spatial-temporal variability in terms of hydrological regimes, weather conditions, and pesticide application schemes, and complements environmental monitoring studies that have shown unacceptable exposure levels for aquatic organisms in ditches and lagoons of the same study area (Calvo et al., 2021).

Our results show that the fungicides azoxystrobin and difenoconazole, and the herbicide MCPA, pose the largest ecotoxicological risks. Azoxystrobin and difenoconazole were introduced in the ANP as replacements of more toxic (prochloraz, tebuconazole), or recently banned (carbendazim) fungicides (Andreu Sánchez, 2008). However, as shown in this study, short and long-term ecological risks in the rice production area of the ANP may be expected. Semi-field experiments performed in Sweden and the Netherlands show chronic toxic effects of azoxystrobin at concentrations that are an order of magnitude lower than the TWACs calculated in this study, with copepods and some Cladocera showing the largest abundance declines (Gustafsson et al., 2010; van Wijngaarden et al., 2014). Difenoconazole has proven to be very toxic to daphnids (Moreira et al., 2020), fish and algae (Man et al., 2021) in other ecosystems impacted by rice production (Shen et al., 2022). On the other hand, MCPA is relatively toxic to eelgrass and dicotyledonous aquatic plants (Nielsen & Dahllöf, 2007), and has been highlighted as one of the most toxic compounds in other rice production areas such as the Ebro Delta in Spain (Barbieri et al., 2020).

Our study shows how climate conditions can influence pesticide exposure and risks. In this case-study, local precipitation events occurring around the time of pesticide applications were found to be more determinant than temperature increases forecasted for the next decades. Therefore, further attention should be paid to integrate changes in precipitation regimes, including extreme rainfall events, into future pesticide risk assessment scenarios for the Mediterranean region.

The outcomes of the risk assessment show that the implementation of environmental protection measures, such as the dose reduction measure promoted by the 'Farm-to-Fork' strategy, will be key to reduce the aquatic risks of pesticides in the next decades. However, the reduction in 50 % of the dose does not completely prevent risks for some pesticides. Additional risk reduction measures, such as the replacement of highly hazardous substances, the incorporation of integrated pest management practices or the construction of constructed wetlands can limit pesticide emissions to surrounding water bodies (Alexoaei et al., 2022; Martín et al., 2020; Pavlidis & Karasali, 2020; Silva et al., 2022). A recent study by Rodrigo et al. (2022) shows that two constructed wetlands located next to rice production areas can reduce metal loads and the number of pesticides entering the Albufera Lake. Further studies should be developed to calculate pesticide transport in the drainage ditches of the ANP and potential risks for aquatic communities in the Albufera Lake under different weather and pesticide management scenarios.

The modelling approach described here offers opportunities to predict pesticide risks in a complex spatial-temporal environmental setting; however, it has some caveats. On the one hand, it disregards the formation of hazardous pesticide metabolites and transformation products (Li, 2021). Accounting for the influence of temperature on pesticide transformation rates in the different scenarios and calculating risks for parent compounds and metabolites could have made the differences between the baseline and future risk scenarios less evident. Although the RICEWQ model includes some processes to account for metabolite formation, we found that the amount of data to characterize the influence of temperature on their formation rate and their ecotoxicological risks was too limited. Therefore, this aspect was not included as part of this study.

Another major limitation is that we characterized the sensitivity of aquatic ecosystems in the ANP using acute and chronic SSDs for a selection of (standard) test species, which are not necessarily representative for Mediterranean wetland ecosystems. Furthermore, the sensitivity of these aquatic ecosystems was considered to be constant over the 2050 and the 2100 climate scenarios (i.e., the same SSD parameters were used for the future scenario evaluations). Some studies suggest that aquatic organisms will have a higher sensitivity to pesticide exposure in scenarios of elevated (+5 °C) temperature (Camp & Buchwalter, 2016; Roth et al., 2022; Vilas-Boas et al., 2021). Therefore, our risk projections may have, to some extent, underestimated actual ecological risks. On the other hand, climate change, and the extreme weather events associated to it are expected to affect the structure of aquatic communities (Polazzo et al., 2022), filtering for species assemblages that may be more (or less) sensitive to different pesticides. These aspects should be further investigated and potentially incorporated into future pesticide risk projections for the Mediterranean region.

4. Conclusions

This study shows how Bayesian network approaches can be used to evaluate the influence of different climate change and pesticide management scenarios on the ecological risks of pesticides. The case-study performed here for the nine pesticides used in rice production in the ANP shows that future climate projections will result in lower exposure and risk distributions in scenarios dominated by an increase of temperatures, while exposure and risks can increase for some pesticides applied during periods of heavy precipitation events, which will be more recurrent in the future. Moreover, it shows that three out of the nine evaluated pesticides (azoxystrobin, difenoconazole and MCPA) pose high ecological risks for aquatic organisms and should be included in further ecotoxicological experiments and monitoring programs in the study area. Finally, we have demonstrated that the increase of pesticide dosages due to the higher prevalence of agricultural pests is going to increase the ecological risks for aquatic organisms in Mediterranean coastal wetlands, and that the implementation of pesticide use reduction programs, such as the European 'Farm-to-Fork' strategy, are crucial to reduce pesticide risks, although will need additional measures to completely prevent them.

Corrections to the Supplementary material

Influence of climate change and pesticide use practices on the ecological risks of pesticides in a protected Mediterranean wetland: A Bayesian network approach

Table S4
Pesticide exposure distribution parameters obtained with the RICEWQ model and species sensitivity distribution (SSD) parameters. Ac: acute toxicity; Chr: chronic toxicity; PEC: peak exposure concentrations; TWAC: time weighted average concentrations.

Compound	Scenarios	Exposure distribution		Effect distribution	
		Type	Parameters	Type	Parameters
Acetamiprid	PEC-2008-	Normal	Mean:0.03; sd: 0.01	Log-normal	Ac: 5.6 (meanlog), 3.6 (sdlog); Chr: 5.8 (meanlog), 4(sdlog)
	PEC-2008		Mean: 0.09; sd: 0.04		
	PEC-2008+		Mean: 0.12; sd: 0.05		
	PEC-2050-		Mean: 0.08; sd: 0.03		
	PEC-2050		Mean: 0.25; sd: 0.09		
	PEC-2050+		Mean: 0.33; sd: 0.12		
	PEC-2100-		Mean: 0.03; sd: 0.01		
	PEC-2100		Mean: 0.1; sd: 0.03		
	PEC-2100+		Mean: 0.14; sd: 0.04		
	TWAC-2008-		Mean: 0.01; sd: 0.003		
	TWAC-2008		Mean: 0.03; sd: 0.01		
	TWAC-2008+		Mean: 0.04; sd: 0.01		
	TWAC-2050-		Mean: 0.02; sd: 0.01		
	TWAC-2050		Mean: 0.06; sd: 0.02		
	TWAC-2050+		Mean: 0.09; sd: 0.03		
	TWAC-2100-		Mean: 0.01; sd: 0.003		
	TWAC-2100		Mean: 0.02; sd: 0.01		
	TWAC-2100+		Mean: 0.03; sd: 0.01		
Azoxystrobin	PEC-2008-	Normal	Mean: 39; sd: 4.9	Log-normal	Ac: 6.3 (meanlog); 1.5 (sdlog); Chr: 3.8 (meanlog); 3 (sdlog)
	PEC-2008		Mean: 78; sd: 9.9		
	PEC-2008+		Mean: 117; sd: 14		
	PEC-2050-		Mean: 35; sd: 4.7		
	PEC-2050		Mean: 70; sd: 9.4		
	PEC-2050+		Mean: 104; sd: 12		
	PEC-2100-		Mean: 33; sd: 4.3		
	PEC-2100		Mean: 67; sd: 8.6		
	PEC-2100+		Mean: 101; sd: 12.8		
	TWAC-2008-		Mean: 7.6; sd: 1.8		
	TWAC-2008		Mean: 15; sd: 3.7		
	TWAC-2008+		Mean: 22; sd: 5.6		
	TWAC-2050-		Mean: 6.2; sd: 1.4		
	TWAC-2050		Mean: 12; sd: 2.8		
	TWAC-2050+		Mean: 18; sd: 4.2		
	TWAC-2100-		Mean: 6.1; sd: 1.3		
	TWAC-2100		Mean: 12; sd: 2.6		
	TWAC-2100+		Mean: 18; sd: 3.9		
Bentazon	PEC-2008-	Normal	Mean: 5.3; sd: 0.84	Log-normal	Ac: 9.1 (meanlog); 2.7 (sdlog); Chr: 7 (meanlog); 2.1 (sdlog)
	PEC-2008		Mean: 10; sd: 1.68		
	PEC-2008+		Mean: 16; sd: 2.5		
	PEC-2050-		Mean: 3.7; sd: 0.73		
	PEC-2050		Mean: 7.3; sd: 1.46		
	PEC-2050+		Mean: 11; sd: 2.1		
	PEC-2100-		Mean: 2.5; sd: 0.52		
	PEC-2100		Mean: 5; sd: 1.2		
	PEC-2100+		Mean: 11; sd: 2.1		
	TWAC-2008-		Mean: 3.3; sd: 1.1		
	TWAC-2008		Mean: 6.7; sd: 2.2		
	TWAC-2008+		Mean: 10; sd: 3.4		
	TWAC-2050-		Mean: 1.8; sd: 0.68		
	TWAC-2050		Mean: 3.6; sd: 1.3		
	TWAC-2050+		Mean: 5.5; sd: 2		
	TWAC-2100-		Mean: 0.95; sd: 0.35		
	TWAC-2100		Mean: 1.9; sd: 0.71		
	TWAC-2100+		Mean: 2.85; sd: 1		
Cyhalofop-buthyl	PEC-2008-	Normal	Mean: 0.71; sd: 0.32	Log-normal	Ac: 7.6 (meanlog); 1.6 (sdlog); Chr: 4.1 (meanlog); 2.7 (sdlog)
	PEC-2008		Mean: 1.4; sd: 0.64		
	PEC-2008+		Mean: 2.1; sd: 0.96		
	PEC-2050-		Mean 0.52; sd: 0.24		
	PEC-2050		Mean: 1; sd: 0.48		
	PEC-2050+		Mean: 1.5; sd: 0.72		
	PEC-2100-		Mean: 0.23; sd: 0.07		
	PEC-2100		Mean: 0.47; sd: 0.14		
	PEC-2100+		Mean: 0.7; sd: 0.22		
	TWAC-2008-		Mean: 0.19; sd: 0.05		
	TWAC-2008		Mean: 0.38; sd: 0.1		
	TWAC-2008+		Mean: 0.56; sd: 0.15		
	TWAC-2050-		Mean: 0.12; sd: 0.04		
	TWAC-2050		Mean: 0.24; sd: 0.08		
	TWAC-2050+		Mean: 0.37; sd: 0.11		
	TWAC-2100-		Mean: 0.04; sd: 0.01		
	TWAC-2100		Mean: 0.09; sd: 0.05		
	TWAC-2100+		Mean: 0.13; sd: 0.04		

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Table S4 (*continued*)

Compound	Scenarios	Exposure distribution		Effect distribution	
		Type	Parameters	Type	Parameters
Difenoconazole	PEC-2008-	Normal	Mean: 8.2; sd: 0.72	Log-normal	Ac: 5.4 (meanlog); 1.9 (sdlog); Chr: 2.5 (meanlog); 2.2 (sdlog)
	PEC-2008		Mean: 16; sd: 1.4		
	PEC-2008+		Mean: 26; sd: 2.2		
	PEC-2050-		Mean: 6.7; sd: 0.81		
	PEC-2050		Mean: 13; sd: 1.6		
	PEC-2050+		Mean: 21; sd: 2.5		
	PEC-2100-		Mean: 6.2; sd: 0.64		
	PEC-2100		Mean: 12; sd: 1.28		
	PEC-2100+		Mean: 19; sd: 2		
	TWAC-2008-		Mean: 0.92; sd: 0.11		
	TWAC-2008		Mean: 1.83; sd: 0.22		
	TWAC-2008+		Mean: 2.9; sd: 0.34		
	TWAC-2050-		Mean: 0.71; sd: 0.08		
	TWAC-2050		Mean: 1.4; sd: 0.15		
	TWAC-2050+		Mean: 2.2; sd: 0.24		
	TWAC-2100-		Mean: 0.71; sd: 0.05		
	TWAC-2100		Mean: 0.67; sd: 0.06		
	TWAC-2100+		Mean: 2.2; sd: 0.16		
Imazamox	PEC-2008-	Normal	Mean: 1.8; sd: 0.59	Log-normal	Ac: 6.7 (meanlog); 3 (sdlog); Chr: 3.8 (meanlog); 2.2 (sdlog)
	PEC-2008		Mean: 2.4; sd: 0.79		
	PEC-2008+		Mean: 3.6; sd: 1.1		
	PEC-2050-		Mean: 1.8; sd: 0.55		
	PEC-2050		Mean: 2.4; sd: 0.73		
	PEC-2050+		Mean: 3.6; sd: 1.1		
	PEC-2100-		Mean: 1.7; sd: 0.53		
	PEC-2100		Mean: 2.3; sd: 0.71		
	PEC-2100+		Mean: 3.4; sd: 1		
	TWAC-2008-		Mean: 1.6; sd: 0.68		
	TWAC-2008		Mean: 2.1; sd: 0.83		
	TWAC-2008+		Mean: 3.2; sd: 1.2		
	TWAC-2050-		Mean: 1.5; sd: 0.58		
	TWAC-2050		Mean: 2; sd: 0.77		
	TWAC-2050+		Mean: 3.1; sd: 1.1		
	TWAC-2100-		Mean: 1.5; sd: 0.55		
	TWAC-2100		Mean: 2; sd: 0.74		
	TWAC-2100+		Mean: 3; sd: 1.1		
MCPA	PEC-2008-	Normal	Mean: 17; sd: 2.6	Log-normal	Ac: 9.9 (meanlog); 2.9 (sdlog); Chr: 6.6 (meanlog); 3 (sdlog)
	PEC-2008		Mean: 35; sd: 5.2		
	PEC-2008+		Mean: 52; sd: 7.9		
	PEC-2050-		Mean: 14; sd: 1.9		
	PEC-2050		Mean: 28; sd: 3.9		
	PEC-2050+		Mean: 42; sd: 5.9		
	PEC-2100-		Mean: 10; sd: 1.2		
	PEC-2100		Mean: 21; sd: 2.5		
	PEC-2100+		Mean: 32; sd: 3.8		
	TWAC-2008-		Mean: 11; sd: 3.5		
	TWAC-2008		Mean: 22; sd: 7		
	TWAC-2008+		Mean: 34; sd: 10		
	TWAC-2050-		Mean: 7.7; sd: 2.2		
	TWAC-2050		Mean: 15; sd: 4.4		
	TWAC-2050+		Mean: 23; sd: 6.6		
	TWAC-2100-		Mean: 4.7; sd: 1.1		
	TWAC-2100		Mean: 9.4; sd: 2.3		
	TWAC-2100+		Mean: 14; sd: 3.5		
Penoxsulam	PEC-2008-	Normal	Mean: 0.34; sd: 0.06	Log-normal	Ac: 7.1 (meanlog); 3.8 (sdlog);Chr: 4.5 (meanlog); 3.4 (sdlog)
	PEC-2008		Mean: 0.68; sd: 0.13		
	PEC-2008+		Mean: 1; sd: 0.19		
	PEC-2050-		Mean: 0.32; sd: 0.07		
	PEC-2050		Mean: 0.65; sd: 0.13		
	PEC-2050+		Mean: 0.97; sd: 0.2		
	PEC-2100-		Mean: 0.27; sd: 0.04		
	PEC-2100		Mean: 0.53; sd: 0.08		
	PEC-2100+		Mean: 0.8; sd: 0.13		
	TWAC-2008-		Mean: 0.27; sd: 0.08		
	TWAC-2008		Mean: 0.54; sd: 0.17		
	TWAC-2008+		Mean: 0.81; sd: 0.25		
	TWAC-2050-		Mean: 0.26; sd: 0.08		
	TWAC-2050		Mean: 0.51; sd: 0.16		
	TWAC-2050+		Mean: 0.77; sd: 0.23		
	TWAC-2100-		Mean: 0.19; sd: 0.05		
	TWAC-2100		Mean: 0.37; sd: 0.1		
	TWAC-2100+		Mean: 0.56; sd: 0.15		

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Table S4 (*continued*)

Compound	Scenarios	Exposure distribution		Effect distribution	
		Type	Parameters	Type	Parameters
Propanil	PEC-2008-	Normal	Mean: 0.52; sd: 0.07	Log-normal	Ac: 7.8 (meanlog); 2.1 (sdlog); Chr: 3.4 (meanlog); 1.3 (sdlog)
	PEC-2008		Mean: 1; sd: 0.14		
	PEC-2008+		Mean: 1.5; sd: 0.22		
	PEC-2050-		Mean: 1.6; sd: 0.42		
	PEC-2050		Mean: 3.2; sd: 0.84		
	PEC-2050+		Mean: 4.8; sd: 1.2		
	PEC-2100-		Mean: 0.57; sd: 0.06		
	PEC-2100		Mean: 1.1; sd: 0.13		
	PEC-2100+		Mean: 1.7; sd: 0.19		
	TWAC-2008-		Mean: 0.1; sd: 0.01		
	TWAC-2008		Mean: 0.2; sd: 0.01		
	TWAC-2008+		Mean: 0.3; sd: 0.02		
	TWAC-2050-		Mean: 0.26; sd: 0.05		
	TWAC-2050		Mean: 0.52; sd: 0.11		
	TWAC-2050+		Mean: 0.77; sd: 0.16		
	TWAC-2100-		Mean: 0.09; sd: 0.01		
	TWAC-2100		Mean: 0.18; sd: 0.01		
	TWAC-2100+		Mean: 0.27; sd: 0.02		

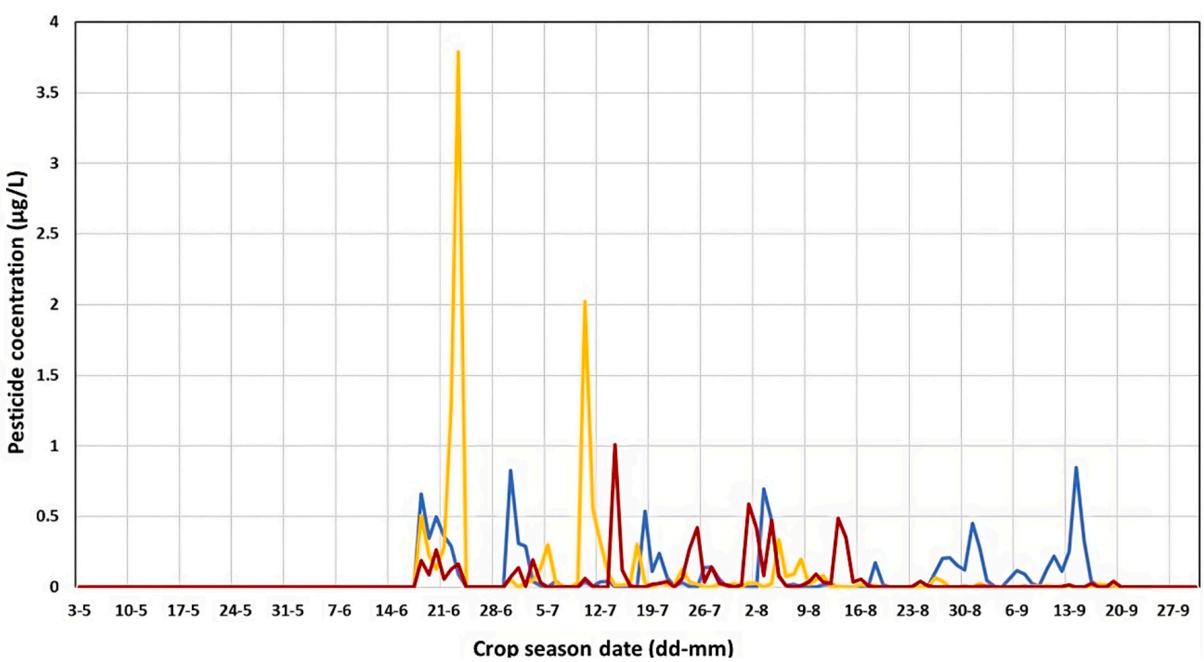

Fig. S3. Exposure concentration profile calculated with the RICEWQ model for the herbicide propanil in a given rice production cluster ("*02_Carrera_del_Saler0-2_0*") using the recommended application dose. Colors represent different climate scenarios: blue (2008), yellow (2050), red (2100). Concentration generally occur after rainfall events.