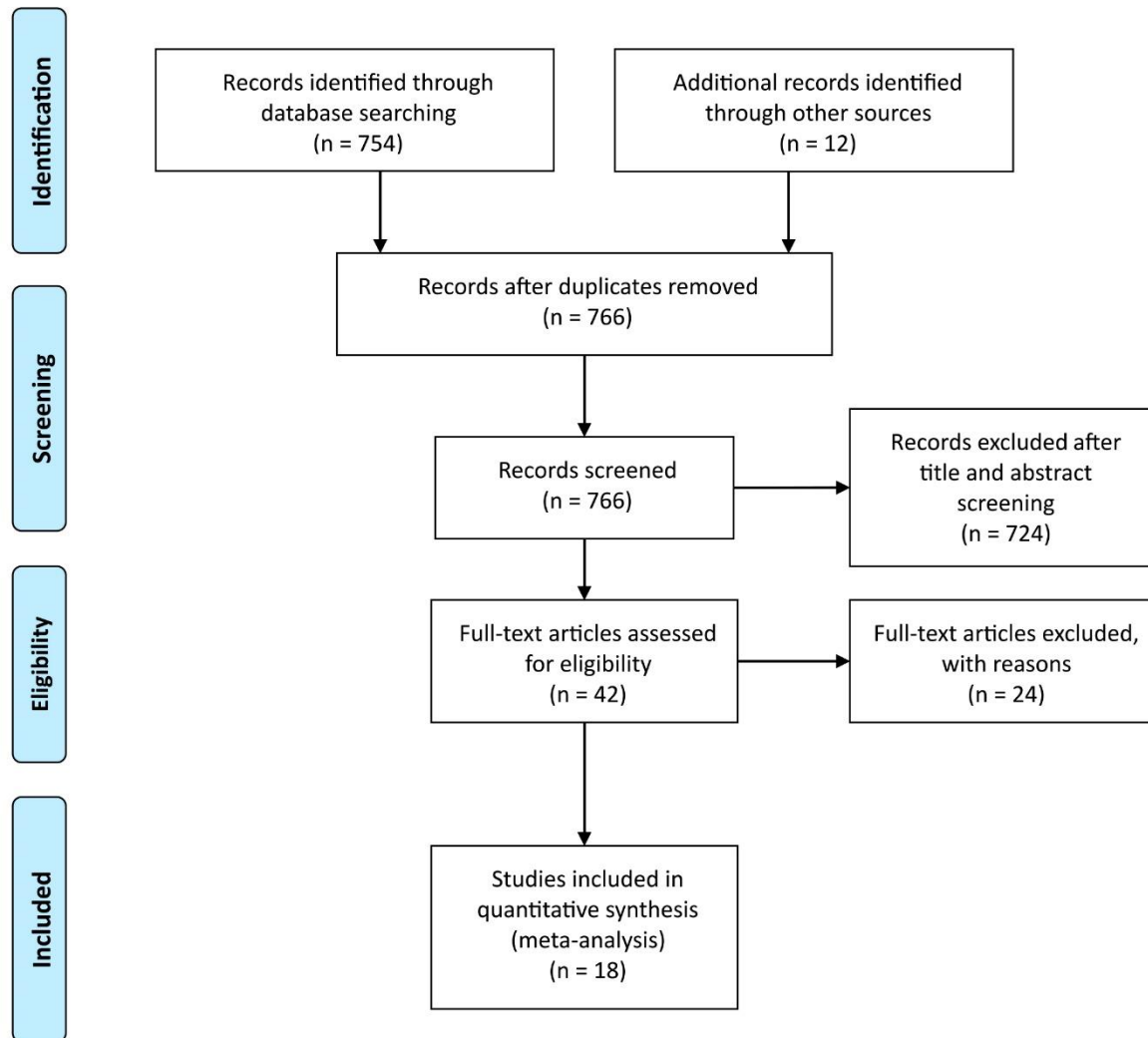


Supplementary Material



Supplementary Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Moher *et al.* 2009) flow chart presenting the selection of studies for the meta-analysis of associations between climate-related environmental variables and aquatic insects in Northwest Africa.

Supplementary Table 1. Publications used in analyses with number of sites, and mean values for number of families (Fam), altitude (Alt, m), water temperature (Temp, [°C]), EC ([μS/cm]), river size (Size, [m²]), Global Aridity Index (GAI), degree of regulation (Reg [%]), cropland extent (Crop, [%]), urban extent (Urb, [%]) and number of samplings taken per site (Samp). In the case of “Bonada”, the data was obtained from MacroMED (Blanco-Garrido et al., 2013).

Publication	Sites	Fam	Alt	Temp	EC	Size	GAI	Reg	Crop	Urb	Samp
Benzina , I., Bachir, A. S., Ghazi, C., Santoul, F., Céréghino, R. (2019). How altitudinal gradient affects the diversity and composition of benthic insects in arid areas streams of northern East Algeria?. <i>Biologia</i> 75, 567-577. doi: 10.2478/s11756-019-00326-8	23	8.2	1330	14.2	577	0.5	38	0	0	10	3
Berger , E., Bossenbroek, L., Beermann, A. J., Schäfer, R. B., Znari, M., Riethmüller, S., et al. (2021). Social-ecological interactions in the Draa River Basin, southern Morocco: Towards nature conservation and human well-being using the IPBES framework. <i>Sci. Total. Environ.</i> 769:144492. doi: 10.1016/j.scitotenv.2020.144492	14	12.2	720	29.6	4462	17	8	98	5	14	1
Berrahou , A., Cellot, B., Richoux, P. (2001). Distribution longitudinale des macroinvertébrés benthiques de la Moulouya et de ses principaux affluents (Maroc). <i>Ann. Limnol. - Int. J. Lim.</i> 37(3), 223-235. doi: 10.1051/limn/2001020	10	10.4	624	23.5	1172	8.7	19	33	10	6	2
Bonada , N., Dolédec, S., Statzner, B. (2007). Taxonomic and biological trait differences of stream macroinvertebrate communities between mediterranean and temperate regions: implications for future climatic scenarios. <i>Glo. Change Biol.</i> 13(8), 1658-1671. doi: 10.1111/j.1365-2486.2007.01375.x	3	5	1150	9.9	472	5.5	90	0	1	0	1
Ghougali , F., Bachir, A. S., Chaabane, N., Brik, I., Medjber, R. A., Rouabah, A. (2019). Diversity and distribution patterns of benthic insects in streams of the Aurès arid region (NE Algeria). <i>Oceanol. Hydrobiol. St.</i> 48(1), 31-42. doi: 10.1515/ohs-2019-0004	6	9.7	1264	19.5	654	0.5	40	0	0	5	1
Giudicelli , J., and Dakki, M. (1984). Les Sources du Moyen Atlas et de Rif (Maroc): Faunistique (Description de Deux Espèces Nouvelles de Trichoptères), Écologie, Intérêt Biogéographique. <i>Bijdr. Dierkd.</i> 54, 83-100. doi: 10.1163/26660644-05401007	1	5	1910	9.5	400	1.7	55	0	1	0	7
Gutiérrez-Cánovas , C., Arribas, P., Naselli-Flores, L., Bennas, N., Finocchiaro, M., Millán, A., et al. (2019). Evaluating anthropogenic impacts on naturally stressed ecosystems: Revisiting river classifications and biomonitoring metrics along salinity gradients. <i>Sci. Total. Environ.</i> 658, 912-921. doi: 10.1016/j.scitotenv.2018.12.253	28	15.4	217	18.3	24496	3.8	33	9	10	2	1
Haouchine , N. (2010) Evaluation de la qualité hydrobiologique du réseau hydrographique de l’oued El Harrach (w.de Blida et d’Alger). [dissertation]. [Bab Ezzouar (Algeria)]: Université des sciences et de la technologie Houari-Boumediène	15	23.7	98	18.7	1530	9.5	63	0	64	55	12
Hinchi , I., Bouayad, K., Fadil, F. (2020). Hydrobiological study of the source Tadout (Middle Atlas, Morocco): Physical chemistry, microbiology and benthic fauna. <i>Global Scient. J.</i> 8(1), 1451-1473.	1	10	1300	18.8	651	3.7	28	0	2	0	8
Karrouch , L., Chahlaoui, A., Essahale, A. (2017). Anthropogenic Impacts on the Distribution and Biodiversity of Benthic Macroinvertebrates and Water Quality of the Boufekrane River, Meknes, Morocco. <i>J. Geosci. Environ. Protect.</i> 5(7), 173-195. doi: 10.4236/gep.2017.57014	6	21	628	19.4	974	7.7	42	0	67	32	12
Maamri , A., Pattee, E., Dolédec, S., Chergui, H. (2005). The benthic macroinvertebrate assemblages in the Zegzel-Cherraa, a partly-temporary river system, Eastern Morocco. <i>Ann. Limnol. - Int. J. Lim.</i> 41(4), 247-257. doi: 10.1051/limn/2005017	5	21.6	265	22.2	366	1	26	0	89	22	12
Mabrouki , Y., Taybi, A. F., El Alami, M., Berrahou, A. (2019). Biotypology of stream macroinvertebrates from North African and semi arid catchment: Oued Za (Morocco). <i>Knowl. Manag. Aquat. Ecosyst.</i> 420:17. doi: 10.1051/kmae/2019009	11	25.7	731	19.9	944	8.8	21	0	1	4	3
Nechad , I., and Fadil, F. (2016). Taxonomic diversity of benthic stands of the Tataw source (Imouzer Marmoucha, Middle Atlas - Morocco). <i>Int. J. Scient. Eng. Res.</i> 7(8), 592-608.	1	10	1710	11.4	353	1.5	20	0	0	0	12
Sellam , N., Viñolas, A., Zougaghe, F., Moulaï, R. (2019). Assesment of the physico-chemical and biological quality of surface waters in arid and semi-arid regions of Algeria (North-Africa). <i>B. Soc. Zool. Fr.</i> 144(4): 157-178.	2	22	1036	20.9	2957	2.3	20	0	16	0	3
Souilmi , F., Ghedda, K., Fahde, A., Fihri, F. Z. E., Tahraoui, S., Elasri, F., et al. (2019). Taxonomic diversity of benthic macroinvertebrates along the Oum Er Rbia River (Morocco): implications for water quality bio-monitoring using indicator species. <i>W. Afr. J. Appl. Ecol.</i> 27(1), 137-149.	10	19.3	709	20.1	2270	6	41	197	57	12	4
Touabay , M., Aouad, N., Mathieu, J. (2002). Etude hydrobiologique d’un cours d’eau du Moyen-Atlas : l’oued Tizguit (Maroc). <i>Ann. Limnol. - Int. J. Lim.</i> 38(1), 65-80. doi: 10.1051/limn/2002007	11	20.5	1654	13.3	382	1.9	67	0	45	12	12
Khebiza , M. Y., Boughrous, A. A., Gabbanini, C., Messouli, M., Messina, G. (2006). Impact of waste discharges on the water quality and interstitial community structure of two Mediterranean rivers. <i>Ital. J. Zool.</i> 73(2), 153-166. doi: 10.1080/11250000600679462	5	13.4	1192	17.1	263	7.8	38	0	41	11	12
Yasri , N. (2009). Diversite, Ecologie et Biogeographie des Macroinvertébrés de Quelques Affluents du Mazafran. [dissertation]. [Bab Ezzouar (Algeria)]: Université des sciences et de la technologie Houari-Boumediène	13	15.3	182	20.3	1257	9.7	67	644	48	37	11

Supplementary Table 2. Biological traits used in the study and their different categories, based on Tachet et al. (2000).

Variable	Trait	Category
1	Size	a: $\leq .25$ cm; b: $> .25$ -.5 cm; c: $> .5$ -1 cm; d: > 1 -2 cm; e: > 2 -4 cm; f: > 4 -8 cm
2	Life cycle duration	a: ≤ 1 year; b: > 1 year
3	Potential number of cycles / year	a: < 1 ; b: 1, c: > 1
4	Aquatic stages	a: egg; b: larva; c: nymph; d: adult
5	Reproduction	a: ovoviviparity; b: isolated eggs, free; c: isolated eggs, cemented; d: clutches, cemented or fixed; e: clutches, free; f: clutches, in vegetation; g: clutches, terrestrial
6	Dispersal	a: aquatic passive; b: aquatic active; c: aerial passive; d: aerial active
7	Resistance form	a: eggs, statoblasts; b: cocoons; c: housings against desiccation; d: diapause or dormancy; e: none
8	Respiration	a: tegument; b: gill; c: plastron; d: spiracle; e: hydrostatic vesicle
9	Locomotion and substrate	a: flier; b: surface swimmer; c: full water swimmer; d: crawler; e: burrower; f: interstitial; g: temporarily attached; h: permanently attached
10	Food	a: microorganisms; b: detritus (< 1 mm); c: dead plant (≥ 1 mm); d: living microphytes; e: living macrophytes; f: dead animal (≥ 1 mm); g: living microinvertebrates; h: living macroinvertebrates; i: vertebrates
11	Feeding habits	b: deposit feeder; c: shredder; d: scraper; e: filter-feeder; f: piercer; g: predator; h: parasite