BEFORE NOV 26

1. Ovaskainen, O., et al. Community-level phenological response to climate change. *P. Natl. Acad. Sci. USA* **110**, 13434-13439 (2013).

2. CaraDonna, P. J., Iler, A. M. and Inouye, D. W. Shifts in flowering phenology reshape a subalpine plant community. *P. Natl. Acad. Sci. USA* **111**, 4916-4921 (2014).

3. Thackeray, S. J., et al. Phenological sensitivity to climate across taxa and trophic levels. *Nature* **535**, 241 (2016).

4. Kharouba, H. M., et al. Global shifts in the phenological synchrony of species interactions over recent decades. *P. Natl. Acad. Sci. USA* **115**, 5211-5216 (2018).

5. Post, E. and Forchhammer, M. C. Climate change reduces reproductive success of an Arctic herbivore through trophic mismatch. *Philos. T. Roy. Soc. B* **363**, 2367-2373 (2007).

6. Plard, F., et al. Mismatch between birth date and vegetation phenology slows the demography of roe deer. *PLoS biology* **12**, e1001828 (2014).

7. Doiron, M., Gauthier, G. and Lévesque, E. Trophic mismatch and its effects on the growth of young in an Arctic herbivore*. Global Change Biol.*  **21**, 4364-4376 (2015).

8. Burkle, L. A., Marlin, J. C. and Knight, T. M. Plant-pollinator interactions over 120 years: loss of species, co-occurrence, and function. *Science* **339**, 1611-1615 (2013).

9. Vatka, E., Orell, M. and RytkÖnen, S. Warming climate advances breeding and improves synchrony of food demand and food availability in a boreal passerine. *Global Change Biol.* **17**, 3002-3009 (2011).

10. Burthe, S., et al. Phenological trends and trophic mismatch across multiple levels of a North Sea pelagic food web*.* *Marine Ecol. Prog. Ser.*  **454**, 119-133 (2012).

11. Reed, T. E., Jenouvrier, S. and Visser, M. E. Phenological mismatch strongly affects individual fitness but not population demography in a woodland passerine. *J. Anim. Ecol.* **82**, 131-144 (2013).

12. Gienapp, P., Reed, T. E., and Visser, M. E. Why climate change will invariably alter selection pressures on phenology. *P. Roy. Soc. B- Biol. Sci.* **281**, 20141611 (2014).

13. Johansson, J., Kristensen, N. P., Nilsson, J.-Å. and Jonzén, N. The eco-evolutionary consequences of interspecific phenological asynchrony--a theoretical perspective. *Oikos* **124**, 102-112 (2015).

14. Bewick, S., Cantrell, R. S., Cosner, C. and Fagan, W. F. How resource phenology affects consumer population dynamics. *Am. Nat.* **187**, 151-166 (2016).

15. Samplonius, J. M., Kappers, E. F., Brands, S. and Both, C.Phenological mismatch and ontogenetic diet shifts interactively affect offspring condition in a passerine*. J. Anim. Ecol.* **85**, 1255-1264 (2016).

16. Hjort, J., Fluctuations in the great fisheries of northern Europe viewed in the light of biological research. *ICES* (1914).

17. Cushing, D.H. The regularity of the spawning season of some fishes. *ICES J. Mar. Sci.* ***33***, 81-92 (1969).

18. Cushing, D. H. The natural regulation of fish populations. HardenJones, F. R. *(ed.)* *Sea Fisheries Research*. Elek Science, 399-412 (1974).

19. Cushing, D.H. Plankton production and year-class strength in fish populations: an update of the match/mismatch hypothesis. In *Advances in marine biology* (Vol. 26, 249-293). Academic Press (1990).

20. Miller-Rushing, A. J., Høye, T. T., Inouye, D. W. and Post, E. The effects of phenological mismatches on demography. *Philos. T. Roy. Soc. B* **365**, 3177-3186 (2010).

21. Renner, S. S. and Zohner, C. M. Climate change and phenological mismatch in trophic interactions among plants, insects, and vertebrates. *Annu. Rev. Ecol. Evol. S.* **49**, 165-182 (2018).

22. Leggett, W. and Deblois, E. Recruitment in marine fishes: is it regulated by starvation and predation in the egg and larval stages? *Neth. J. Sea Res.* **32**, 119-134 (1994).

23. Durant, J. M., Hjermann, D. Ø., Ottersen, G. and Stenseth, N. C. Climate and the match or mismatch between predator requirements and resource availability. *Climate Res.* **33**, 271-283 (2007).

24. Philippart, C. J., et al. Climate-related changes in recruitment of the bivalve *Macoma balthica. Limnol. Oceanogr.*  **48**, 2171-2185 (2003).

25. Atkinson, A., et al. Questioning the role of phenology shifts and trophic mismatching in a planktonic food web. *Prog. Oceanogr.* **137**, 498-512 (2015).

26. Johansson, J. and Jonzén, N. Game theory sheds new light on ecological responses to current climate change when phenology is historically mismatched. *Ecol. Lett.*  **15**, 881-888 (2012).

27. Kerby, J. and Post, E. Capital and income breeding traits differentiate trophic match--mismatch dynamics in large herbivores. *Philos. T. Roy. Soc. B*  **368**, 20120484 (**2013).**

28. Durant, J.M., et al. Extension of the match-mismatch hypothesis to predator-controlled systems. *Mar. Ecol. Progr. Ser.* **474**, 43-52 (2013).

29. Shurin, J. B., Gruner, D. S. and Hillebrand, H. All wet or dried up? Real differences between aquatic and terrestrial food webs. *P. Roy. Soc. B- Biol. Sci.* **273**, 1-9 (2005).

30. Carpenter, S. R. and Kitchell, J. F. The trophic cascade in lakes. *Cambridge University Press*, 1996.

31. Shurin, J. B. and Seabloom, E. W. The strength of trophic cascades across ecosystems: predictions from allometry and energetics. *J. Anim. Ecol.* **74**, 1029-1038 (2005).

32. Borer, E. T., Halpern, B. S. and Seabloom, E. W. Asymmetry in community regulation: effects of predators and productivity. *Ecology* **87**, 2813-2820 (2006).

33. Hampton, S. E., Scheuerell, M. D. and Schindler, D. E. Coalescence in the Lake Washington story: interaction strengths in a planktonic food web*. Limnol. Oceanogr.*  **51**, 2042-2051 (2006).

34. Boggs, C. L. and Inouye, D. W. A single climate driver has direct and indirect effects on insect population dynamics*.* *Ecol. Lett.* **15**, 502-508 (2012).

35. Thackeray, S. J.Mismatch revisited: what is trophic mismatching from the perspective of the plankton?*J. Plankton Res.* **34**, 1001-1010 (2012).

36. Nakazawa, T. and Doi, H. A perspective on match/mismatch of phenology in community contexts. *Oikos* **121**, 489-495 (2012).

37. Revilla, T. A., Encinas-Viso, F. and Loreau, M. (A bit) Earlier or later is always better: Phenological shifts in consumer--resource interactions. *Theor. Ecol.* **7**, 149-162 (2014).

38. Borer, E., et al. What determines the strength of a trophic cascade? *Ecology* **86**, 528-537 (2005).

39. Gruner, D. S., et al. A cross-system synthesis of consumer and nutrient resource control on producer biomass*. Ecol. Lett.* **11**, 740-755 (2008).

40. Betini, G. S., Avgar, T. and Fryxell, J. M. Why are we not evaluating multiple competing hypotheses in ecology and evolution? *Roy. Soc. Open Sci.*  **4**, 160756 (2017).

41. Singer, M. C. and Parmesan, C. Phenological asynchrony between herbivorous insects and their hosts: signal of climate change or pre-existing adaptive strategy? *Philos. T. Roy. Soc. B* **365**, 3161-3176 (2010).

42. Solomon, S. IPCC (2007): Climate change the physical science basis (2007).

43. Adrian, R., Wilhelm, S. and Gerten, D. Life-history traits of lake plankton species may govern their phenological response to climate warming. *Global Change Biol.* **12**, 652-661 (2006).

44. Arula, T., Gröger, J., Ojaveer, H. and Simm, M. Shifts in the spring herring (*Clupea harengus membras*) larvae and related environment in the Eastern Baltic Sea over the past 50 years. PloS one **9**, e91304 (2014).

45. Wolkovich, E., Cook, B., McLauchlan, K. and Davies, T. Temporal ecology in the Anthropocene. *Ecol. Lett.* **17**, 1365-1379 (2014).

46. Edmondson, W. Sixty years of Lake Washington: a curriculum vitae. *Lake Reserv. Manage.* **10**, 75-84 (1994).

47. Sala, O. E., et al. Global biodiversity scenarios for the year 2100**.** *Science* **287**, 1770-1774 (2000).

48. Ricciardi, A., Neves, R. J. and Rasmussen, J. B. Impending extinctions of North American freshwater mussels (Unionoida) following the zebra mussel *(Dreissena polymorpha)* invasion. *J. Anim. Ecol.* **67**, 613-619 (1998).

49. Fritts, T. H. and Rodda, G. H. The role of introduced species in the degradation of island ecosystems: a case history of Guam. *Ann. Rev. Ecol. Syst.* **29**, 113-140 (1998).

50. Verschuren, D., et al. History and timing of human impact on Lake Victoria, East Africa. *P. Roy. Soc. Lond. B Bio.* **269**, 289-294 (2002).

51. Visser, M. E., te Marvelde, L. and Lof, M. E. Adaptive phenological mismatches of birds and their food in a warming world. *J. Ornith*. **153**,75-84 (2012).

52. Wiklund, C. and Torbjörn F. Why do males emerge before females?. Oecologia **31**, 153-158 (1977).

53. Iwasa, Y et al. Emergence patterns in male butterflies: A hypothesis and a test. *Theor. Popul. Biol*. **23**, 363–379 (1983).

54. Johansson, J., Smith, H.G. and Jonzén, N. Adaptation of reproductive phenology to climate change with ecological feedback via dominance hierarchies. *J. Anim. Ecol.* **83**, 440-449 (2014).

55. Visser, M. E., and Gienapp, P. Evolutionary and demographic consequences of phenological mismatches. *Nature ecology & evolution* **3**, 879-88 (2019).

56. Thompson, J.N., The coevolutionary process. University of Chicago Press (1994).

57. Chmura, H. E., et al. The mechanisms of phenology: the patterns and processes of phenological shifts. *Ecol. Monogr.* **89** e01337 (2018).

58. Bauerfeind, S. S. and Fischer, K. Increased temperature reduces herbivore host-plant quality. *Global Change Biol.* **19**, 3272-3282 (2013).

59. Rudolf, V. H. and Singh, M. Disentangling climate change effects on species interactions: effects of temperature, phenological shifts, and body size. *Oecologia* **173**, 1043-1052 (2013).

60. Berger, S. A., Diehl, S., Stibor, H., Sebastian, P. and Scherz, A. Separating effects of climatic drivers and biotic feedbacks on seasonal plankton dynamics: no sign of trophic mismatch. *Freshwater Biol.* **59**, 2204-2220 (2014).

61. George, D. The effect of nutrient enrichment and changes in the weather on the abundance of Daphnia in Esthwaite Water, Cumbria. *Freshwater Biol.* **57**, 360-372 (2012).

62. Law, T., Zhang, W., Zhao, J. and Arhonditsis, G. B. Structural changes in lake functioning induced from nutrient loading and climate variability. *Ecol. Model.* **220**, 979-997 (2009).

63. Francis, T. B., et al. Shifting regimes and changing interactions in the Lake Washington, USA, plankton community from 1962-1994. *PloS one* **9**, e110363 (2014).

64. Vatka, E., Rytkönen, S. and Orell, M.Does the temporal mismatch hypothesis match in boreal populations?*Oecologia* **176**, 595-605 (2014).

65. Holliday, N. Population ecology of winter moth (*Operophtera brumata*) on apple in relation to larval dispersal and time of bud burst. *J. Appl. Ecol.* 803-813 (1977).

66. Tikkanen, O.-P., Niemelä, P. and Keränen, J. Growth and development of a generalist insect herbivore*, Operophtera brumata,* on original and alternative host plants. *Oecologia* **122**, 529-536 (2000).

67. Wiltshire, K. H., et al. Resilience of North Sea phytoplankton spring bloom dynamics: An analysis of long-term data at Helgoland Roads. *Limnol. Oceanogr.* **53**, 1294-1302 (2008).

68. Henrich-Gebhardt, S. G. Temporal and spatial variation in food availability and its effects on fledgling size in the great tit. *Population biology of passerine birds*, 175-185 (1990).

69. Kelleri, L.F. and Van Noordwijk, A. J. Effects of local environmental conditions. *Ardea* **82**, 349-362 (1994).

70. Visser, M. E., Holleman, L. J. M. and Gienapp, P. Shifts in caterpillar biomass phenology due to climate change and its impact on the breeding biology of an insectivorous bird. *Oecologia* **147**, 164-172 (2006).

71. Yang, L. H. and Rudolf, V.H.W. Phenology, ontogeny and the effects of climate change on the timing of species interactions. *Ecol. Lett*. **13**, 1-10 (2010).

72. Borcherding, J., Beeck, P., DeAngelis, D. L. and Scharf, W. R. Match or mismatch: the influence of phenology on size-dependent life history and divergence in population structure. *J. Anim. Ecol.*  **79**, 1101-1112 (**2010).**

**73.** Gullett, P., Hatchwell, B. J., Robinson, R. A. and Evans, K. L. Phenological indices of avian reproduction: cryptic shifts and prediction across large spatial and temporal scales. *Ecol. Evol.* **3**, 1864-1877 (2013).

74. Dornelas, M., et al. Assemblage time series reveal biodiversity change but not systematic loss*. Science* **344**, 296-299 (2014).

75. Sgardeli, V., Zografou, K. and Halley, J. M. Climate change versus ecological drift: assessing 13 years of turnover in a butterfly community. *Basic Appl. Ecol.* **17**, 283-290 (2016).

76. Pakanen, V.-M., Orell, M., Vatka, E., Rytk{\"o}nen, S. and Broggi, J.. Different ultimate factors define timing of breeding in two related species. PloS one, **11**, e0162643 (2016).

77. Lof, M. E., Reed, T. E., McNamara, J. M. and Visser, M. E. Timing in a fluctuating environment: environmental variability and asymmetric fitness curves can lead to adaptively mismatched avian reproduction. *P. Roy. Soc. B- Biol. Sci.* **279**, 3161-3169 (2012).

78. Rasmussen, N. L., Van Allen, B.G., and Rudolf, V.H.W. Linking phenological shifts to species interactions through size-mediated priority effects. *J. Anim., Ecol.*, 83, 1206-1215 (2014).

79. Chuine, I. and Régnière, J. Process-based models of phenology for plants and animals. *Annu. Rev. Ecol. Evol. S.* **48**, 159-182 (2017).

80. Winder, M. and Schindler, D. E.Climate change uncouples trophic interactions in an aquatic ecosystem*.*

*Ecology* **85**, 2100-2106 (2004).

81. Cury, P, Shannon, L and Shin, YJ. The functioning of marine ecosystems: a fisheries perspective*.* *Responsible fisheries in the marine ecosystem* 103–123, (2003).

82. Durant, J. M., et al. Timing and abundance as key mechanisms affecting trophic interactions in variable environments. *Ecol. Lett.* **8**, 952-958 (2005).

83. Kerby, J., Wilmers, C. and Post, E. Climate change, phenology, and the nature of consumer--resource interactions: advancing the match/mismatch hypothesis. Ohgushi, T., Schmitz, O. J. & Holt, R. D. *(ed.)* Trait-mediated indirect interactions: ecological and evolutionary perspectives, Cambridge University Press Cambridge, UK, 508-525 (2012).

84. Kudo, G. and Ida, T.Y. *Early onset of spring increases the phenological mismatch between plants and pollinators*. Ecology **94**, 2311-2320 (2013).

85. van Asch, M. and Visser, M. E. Phenology of forest caterpillars and their host trees: the importance of synchrony. *Annu. Rev. Entomol.* **52**, 37-55 (2007).

86. Tikkanen, O.-P. and Julkunen-Tiitto, R. Phenological variation as protection against defoliating insects: the case of *Quercus robur* and *Operophtera brumata*. *Oecologia* **136**, 244-251 (2003).

87. Visser, M.E., Van Noordwijk, A.J., Tinbergen, J.M., and Lessells, C.M. Warmer springs lead to mistimed reproduction in great tits *(Parus major). Philos. Trans. R. Soc. London B* **265**, 1867-1870 (1998).

88. Charmantier A, et al. Adaptive Phenotypic Plasticity in Response to Climate Change in a Wild Bird Population. *Science***320**, 800-803 (2008).

89. Deacy, W. W., et al. Phenological synchronization disrupts trophic interactions between Kodiak brown bears and salmon. *P. Natl. Acad. Sci. USA* **114**, 10432-10437 (2017)

90. Senner, N. R., Stager, M. and Sandercock, B. K. Ecological mismatches are moderated by local conditions for two populations of a long-distance migratory bird*. Oikos* **126**, 61-72 (2017).

-----

Barner, A. K., et al. Generality in multispecies responses to ocean acidification revealed through multiple hypothesis testing. *Global Change Biol.* **24**, 4464-4477 (2018).

Chen, I.-C., Hill, J. K., Ohlemüller, R., Roy, D. B. and Thomas, C. D. Rapid range shifts of species associated with high levels of climate warming. *Science* **333**, 1024-1026 (2011).

Lavergne, S., Mouquet, N., Thuiller, W. and Ronce, O. Biodiversity and climate change: integrating evolutionary and ecological responses of species and communities. *Annu. Rev. Ecol. Evol. S.* **41**, 321-350 (2010).

Levins, R., 1968. Evolution in changing environments: some theoretical explorations (No. 2). Princeton University Press.

Menzel, A., et al. European phenological response to climate change matches the warming pattern. *Global Change Biol.* **12**, 1969-1976 (2006).

Mouquet, N., et al. Predictive ecology in a changing world. *J. Appl. Ecol.* **52**, 1293-1310 (2015).

O'Connor, M. I., Selig, E. R., Pinsky, M. L. and Altermatt, F. Toward a conceptual synthesis for climate change responses. *Global Ecol. Biogeogr.* **21**, 693-703 (2012).

Ramula, S., Johansson, J., Lindén, A. and Jonzén, N. Linking phenological shifts to demographic change. *Climate Res.* **63**, 135-144 (2015).

Shurin, J. B., et al. A cross-ecosystem comparison of the strength of trophic cascades. *Ecol. Lett.* **5**, 785-791 (2002).