

## Young like it hot

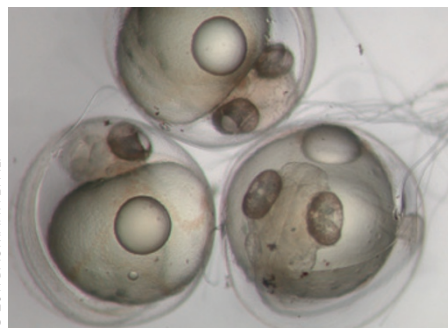
Tropical species are considered to be especially sensitive to climate change because they live close to their thermal maximum and exhibit limited capacity for acclimation. Jennifer Donelson and co-workers show that a tropical reef fish can acclimate rapidly over multiple generations. Exposure to increased temperatures of 1.5 °C and 3.0 °C diminishes the ability of individuals to perform aerobic activities such as swimming or foraging by 15% and 30%, respectively, but this did not occur when both parents and offspring were reared at the higher temperature. These results demonstrate the importance of transgenerational acclimation as a mechanism for coping with rapid climate change.

[Letter p30]

## Acidification impacts fry

Adult fish seem relatively resilient to increased carbon dioxide, but how they fare during early life stages remains less clear. Christopher Gobler and co-workers show that a common estuarine fish exhibits severely reduced survival and growth rates in its early life stages under levels of ocean acidification expected later this century. These findings challenge the belief that ocean acidification will not affect fish populations, because even small changes in early life survival can generate large fluctuations in the abundance of adult fish.

[Letter p38]



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## Ocean oxygen squeeze

One of the impacts of ocean warming is a decrease in dissolved oxygen in the upper ocean. Eric Prince and co-workers show that the oxygenated upper-ocean layer in the tropical northeast Atlantic thinned at a rate of around one metre per year between 1960 and 2010. By tracking individually tagged fish, they also show that this contraction in the oxygenated layer limited the movement of blue marlin. Habitat compression of the sort demonstrated here

is likely to increase the vulnerability of billfishes and tunas to surface fishing gear.

[Letter p33]

## Underestimating carbon

Most global climate models have a well-known bias in the position and strength of the Southern Hemisphere westerly winds — know as the ‘roaring forties’. Now research by Neil Swart and John Fyfe reveals that this bias enhances oceanic carbon uptake in climate change simulations. This finding indicates that carbon–climate model simulations exhibiting this wind-stress bias will tend to overestimate ocean carbon sequestration, and thereby underestimate atmospheric carbon dioxide concentrations in the twenty-first century.

[Letter p47; News & Views p25]

## Biofuels not so sweet

Biofuels are often viewed as a way of mitigating climate change, but their actual impacts on climate and air quality remain uncertain. Elliott Campbell and co-workers estimate air-pollutant emissions over the whole life cycle of sugar-cane ethanol in Brazil. Their comparison of estimates of burning-phase emissions with previous satellite-based estimates suggests that the burning of sugar-cane fields is not fully accounted for in satellite-based inventories owing to the small spatial scale of individual fires. Accounting for this effect suggests that the actual regional burned area is up to four times greater than some previous estimates. Biofuels may therefore have larger impacts on regional climate and human health than previously thought.

[Letter p53]

## Rebounding emissions

Preliminary estimates of global carbon dioxide emissions from fossil-fuel combustion and cement production show that emissions increased by record amounts in 2010 in the aftermath of the recent global financial crisis. A Correspondence by Glen Peters and co-workers suggests that this rapid increase may be due to a swift easing in energy prices and large government investment to promote a speedy economic recovery, in addition to high growth rates in a few key emerging economies, including China and India.

[Correspondence p2]

## Decarbonizing transport

Transport is the fastest-growing and second-largest source of carbon emissions. In a News Feature, Sonja van Renssen asks whether transport can clean up its act. The

analysis focuses on Europe, which is leading the way in transport decarbonization, and investigates major issues preventing decarbonization of shipping and aviation (the largest contributors), as well as that of rail and road transport. The conclusion is that reducing transport emissions requires a fundamental change in how and where we choose to travel, and at what cost. Nevertheless, reducing transport emissions will be at the heart of any successful mitigation pathway.

[News Feature p11]



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## Carbon miscalculations?

The methods used to account for carbon emissions and savings exert considerable influence on the types of action that are promoted and penalized by carbon policies. Some potential calculation pitfalls are highlighted in this issue. A Commentary by Katharina Plassmann shows how methods for assessing the carbon footprints of products can unintentionally favour low-yielding agricultural systems. A related Commentary by Annie Levasseur and co-workers illustrates how sensitive temporary carbon-sequestration estimates are to the methods used.

[Commentaries p4 and p6]

## Is resettlement adaptive?

Realization of gradual yet inexorable sea-level rise has led a growing number of scholars to suggest the necessity of large-scale resettlement of island peoples. In a Commentary, Jon Barnett and Saffron O'Neill argue that resettlement of people living on islands in anticipation of climate impacts risks maladaptation (increasing rather than decreasing vulnerability) and may foreclose alternative adaptation options. They suggest that other forms of population movement carry fewer risks and offer larger rewards in terms of climate change adaptation.

[Commentary p8]