How the Indian monsoon shapes butterfly physiology

Timing is everything, especially when you live for just three months and have to undertake a 350 km journey: female Milkweed butterflies wait till their gruelling migrations – from one side of the Indian peninsula to the other – are over, to invest in reproductive tissues for birth. The Indian monsoon, which prompts these species to migrate to drier areas, shapes the physiology of the female butterflies more than they do to males, reveals a study published in Oikos.

India's Milkweed butterflies undertake a fascinating yearly migration. In April-June, just before the onset of India's intensive southwest monsoon, millions of these butterflies migrate from the wet Western Ghats to the relatively drier eastern plains and hills, across distances of 350-500 km. After migration, they 'swarm' in large numbers: hanging around each other and roosting on plants. They then mate, lay eggs and die. The next generation of butterflies flee from the northeast monsoon that now hits the eastern plains and they migrate to the Western Ghats just as the southwest monsoon retreats from there.

While non-migratory butterflies do not have to worry about timing, how do these Milkweed butterflies invest in body tissues: do they invest in flight tissues in the thorax to fly better, or reproductive tissues in the abdomen for birth? Scientist Dr. Krushnamegh Kunte and his student Vaishali Bhaumik of the National Centre for Biological Sciences in Bengaluru measured the thorax and abdomens of 934 individuals of ten Milkweed migratory and non-migratory butterfly species and examined 3,734 individuals across Kerala, Karnataka and Andhra Pradesh to see how they invest physiologically in flight versus reproduction, during and after their migration.

They found that male butterflies across species – whether migratory or not – did not differ in their physiological investments. But the bodies of female migratory butterflies changed drastically: they invested significantly in abdominal tissue in the reproductive phase after migration, without decreasing investment in flight muscles.

“Our results suggest that female butterflies have more to lose if they do not invest optimally in flight over reproduction during migration. A hiker wouldn’t carry an unnecessarily heavy burden during her trek, and neither would a butterfly,” says the lead author Bhaumik.

“We hope to concentrate on climatic, behavioural, and genetic aspects of their migration,” says Dr. Kunte. “If there are genetic differences between the migratory and non-migratory populations, studying them will help us understand this phenomenon better.”

Source: xaam.in

Economy Mock Test 1 Based on Previous Year IAS Prelims Questions

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India third in nuclear power installations: study

But share of nuclear energy generation stagnates globally, and several countries shut down nuclear reactors in 2017
India is third in the world in the number of nuclear reactors being installed, at six, while China is leading at 20, the World Nuclear Industry Status Report 2017, released this month, shows. The number of nuclear reactor units under construction is, however, declining globally for the fourth year in a row, from 68 reactors at the end of 2013 to 53 by mid-2017, the report says.

The latest report further reveals that most nuclear reactor constructions are behind schedule, with delays resulting in increase in project costs and delay in power generation. There are 37 reactor constructions behind schedule, of which 19 reported further delays over the past year. In India itself, five out of the six reactors under construction are behind schedule. Eight nuclear power projects have been under construction globally for a decade or more, of which three have been so for over 30 years.

In the foreword, S. David Freeman, an American energy policy expert who led the Tennessee Valley Authority under U.S. President Jimmy Carter, writes that the debate regarding the

value of nuclear energy “is over”. “The most decisive part of this report is the final section – Nuclear Power vs Renewable Energy Development. It reveals that since 1997, worldwide, renewable energy has produced four times as many new kilowatt-hours of electricity than nuclear power,” he writes, concluding, “The world no longer needs to build nuclear power plants to avoid climate change and certainly not to save money.”

Data gathered by the authors shows that global nuclear power generation increased by 1.4% in 2016 due to a 23% increase in China, though the share of nuclear energy in electricity generation stagnated at 10.5%. By comparison, globally, wind power output grew by 16% and solar power by 30%. Wind power increased generation by 132 TWh (terawatt hours) or 3.8 times, and solar power by 77 TWh or 2.2 times more than nuclear power’s 35 TWh respectively. Renewables represented 62% of global power generating capacity additions.

Russia and the U.S. shut down reactors in 2016, while Sweden and South Korea both closed their oldest units in the first half of 2017, the report notes.

Financial crisis

The report also documents the financial crisis plaguing the industry. After the discovery of massive losses over its nuclear construction projects, Toshiba filed for bankruptcy of its U.S. subsidiary Westinghouse, the largest nuclear power builder in history. AREVA has accumulated $12.3 billion in losses over the past six years.

French bailout

The French government has provided a $5.3 billion bailout and continues its break-up strategy, the report notes.

In the chapter on the status of the Fukushima nuclear power project in Japan, six years after the disaster began, the report notes how the total official cost estimate for the catastrophe doubled to $200 billion.

The lead authors of the report are Paris-based energy consultant Mycle Schneider, who advised the European Parliament on energy matters for over 20 years, and Antony Froggart, energy policy consultant and senior researcher at Chatham House, a London-based non-profit organisation working on international affairs.

Source: xaam.in

Keeping global warming to 1.5 degrees: really hard, but not impossible

The Paris climate agreement has two aims: “holding the increase in global average temperature to well below 2□ above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5□”. The more ambitious of these is not yet out of reach, according to our new research. Despite previous suggestions that this goal may be a lost cause, our calculations suggest that staying below 1.5□ looks scientifically feasible, if extremely challenging.

Climate targets such as the 1.5□ and 2□ goals have been interpreted in various ways. In practice, however, these targets are probably best seen as focal points for negotiations, providing a common basis for action.

To develop policies capable of hitting these targets, we need to know the size of the "carbon budget" – the total amount of greenhouse emissions consistent with a particular temperature target. Armed with this knowledge, governments can set policies designed to reduce emissions by the corresponding amount.

In a study published in Nature Geoscience, we and our international colleagues present a new estimate of how much carbon budget is left if we want to remain below 1.5□ of global warming relative to pre-industrial temperatures (bearing in mind that we are already at around 0.9□ for the present decade).

We calculate that by limiting total CO_2 emissions from the beginning of 2015 to around 880 billion tonnes of CO_2 (240 billion tonnes of carbon), we would give ourselves a two-in-three chance of holding warming to less than 0.6□ above the present decade. This may sound a lot, but to put it in context, if CO_2 emissions were to continue to increase along current trends, even this new budget would be exhausted in less than 20 years 1.5□ (see Climate Clock). This budget is consistent with the 1.5□ goal, given the warming that humans have already caused, and is substantially greater than the budgets previously inferred from the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), released in 2013-14.

This does not mean that the IPCC got it wrong. Having predated the Paris Agreement, the IPCC report included very little analysis of the 1.5□ target, which only became a political option during the Paris negotiations themselves. The IPCC did not develop a thorough estimate of carbon budgets consistent with 1.5□, for the simple reason that nobody had asked them to.

The new study contains a far more comprehensive analysis of the factors that help to determine carbon budgets, such as

model-data comparisons, the treatment of non-CO_2 gases, and the issue of the maximum rates at which emissions can feasibly be reduced.

Tough task

The emissions reductions required to stay within this budget remain extremely challenging. CO_2 emissions would need to decline by 4-6% per year for several decades. There are precedents for this, but not happy ones: these kinds of declines have historically been seen in events such as the Great Depression, the years following World War II, and during the collapse of the Soviet Union – and even these episodes were relatively brief.

Yet it would be wrong to conclude that greenhouse emissions can only plummet during times of economic collapse and human misery. Really, there is no historical analogy to show how rapidly human societies can rise to this challenge, because there is also no analogy for the matrix of problems (and opportunities) posed by climate change.

There are several optimistic signs that peak emissions may be near. From 2000 to 2013 global emissions climbed sharply, largely because of China's rapid development. But global emissions may now have plateaued, and given the problems that China encountered with pollution it is unlikely that other nations will attempt to follow the same path. Rapid reduction in the price of solar and wind energy has also led to substantial increases in renewable energy capacity, which also offers hope for future emissions trajectories.

In fact, we do not really know how fast we can decarbonise an economy while improving human lives, because so far we haven't tried very hard to find out. Politically, climate change is an "aggregate efforts global public good", which basically means everyone needs to pull together to be successful.

This is hard. The problem with climate diplomacy (and the

reason it took so long to broker a global agreement) is that the incentives for nations to tackle climate change are collectively strong but

This is, unfortunately, the nature of the problem. But our research suggests that a 1.5□ world, dismissed in some quarters as a pipe dream, remains physically possible.

Whether it is politically possible depends on the interplay between technology, economics, and politics. For the world to achieve its most ambitious climate aspiration, countries need to set stronger climate pledges for 2030, and then keep making deep emissions cut for decades.

No one is saying it will be easy. But our calculations suggest that it can be done.

Source: xaam.in

The encephalitis challenge

There must be consensus among major political parties around vital issues like health
Barely a month before the deaths of children in Gorakhpur in Uttar Pradesh, allegedly due to the disruption of oxygen supply in the BRD Medical College, the U.P. Health Minister had addressed a consultation in Lucknow organised by the Observer Research Foundation. He admitted that U.P.'s health system was in the "ICU", and said he was trying hard to fix it. Only the local media reported this. It is a fact that U.P. has a problem: many of the children who died were being treated for acute encephalitis syndrome (AES), including Japanese encephalitis (JE).
The BRD Medical College, with around 800 beds, provides tertiary health-care services to Gorakhpur and adjoining

districts. It is the only tertiary hospital within a 300-km radius. On September 4, 2016, it was reported that 224 children had died of encephalitis in the hospital that year. This hardly made national news. The shocking fact is that if there was no alleged disruption of oxygen supply, the national media and policy experts would not be discussing Gorakhpur now.

Research findings

In U.P., an outbreak of JE has occurred almost every year in four districts between 1978 and 2007, according to research published by the World Health Organisation. Various U.P. governments have set up special wards and set aside specialist doctors for treating the disease. Studies show that in Gorakhpur, incidence of JE has declined from 1.9 per 100,000 in 2010 to 0.5 per 100,000 in 2012, whereas the incidence of JE-negative AES, which is causing a majority of the deaths now, has remained relatively stable over the past five years. From 2006, the Central government has been conducting vaccination drives in endemic areas of JE. In 2011, the JE vaccine was included in the universal immunisation programme (UIP). While an indigenous vaccine was licensed in India in 2013, a Chinese variant was made part of the UIP because of cost considerations. Under the UIP, two doses of JE vaccine are administered to children. However, a study published in the Indian Journal of Medical Research showed that only three out of four children in Gorakhpur had received at least one dose of JE vaccine. The coverage of the second dose was low. Failure to administer the vaccine simultaneously with other vaccines was the most common reason for the lack of coverage and has led to many deaths. To expand coverage, adult JE vaccination was introduced in 2014 in high-burden districts of U.P.

Mass awareness and door-to-door campaigns in districts severely affected by encephalitis, about the causes of the disease and ways of prevention, should be a priority. A study specific to Gorakhpur had suggested a possibility of faecal-oral transmission of the virus by contaminated drinking water. Sanitation, mosquito control, prevention of open defecation, and ensuring clean drinking water can help prevent an outbreak.

The State government needs to allot maximum funds to those

districts most affected by encephalitis. More infrastructure is required in Gorakhpur. Perhaps cost-effective PPP models could also be explored to not just reach out, but also conduct research. Some studies suggest that scrub typhus may have some role in JE-negative AES deaths in Gorakhpur; this needs to be looked into. All this has budget implications. Unfortunately, reports indicate that the Central government released only 68% of budgeted funds for communicable diseases, and an even smaller percentage was utilised. Shockingly, the spending capacity of the health system has proven to be a major bottleneck in U.P. Research shows that in 2015-16, U.P. could spend only 58% of the approved National Rural Health Mission budget.

Encephalitis is a predictable disaster. Its transmission intensifies during the rainy season, during the pre-harvest period in paddy-cultivating regions, and in flood-prone districts. U.P. can learn from other States that have a similar risk profile and that have managed to keep JE/AES mortality in control.

Any substantial developmental goal that India has to achieve needs to be achieved by U.P. first, given the size of the State. It is important that the ruling party works towards building a multipartisan consensus around vital issues like health, so that there is policy focus and such instances of health system paralysis are minimal. Incidents like Gorakhpur are an acute manifestation of chronic, systemic problems of the health sector, and the responsibility to improve things at the earliest lies with the government.

Source: xaam.in

India joins quantum computing

race

DST to fund development of machines that run faster than traditional computers
Keen to tap into the next big advance in computing technology, the Department of Science and Technology (DST) is planning to fund a project to develop quantum computers.

A quantum computer, still largely a theoretical entity, employs the principles of quantum mechanics to store information in ‘qubits’ instead of the typical ‘bits’ of 1 and 0. Qubits work faster because of the way such circuits are designed, and their promise is that they can do intensive number-crunching tasks much more efficiently than the fastest comparable computers.

For instance, to sort a billion numbers, a quantum computer would require 3.5 million fewer steps than a traditional machine, and would find the solution in only 31,623 steps, says a Morgan Stanley analysis last August. Solving other problems, many having to do with computing physics, becomes possible on quantum machines, the authors say, whereas they might never be possible on traditional computers.

While the Physics departments at the Indian Institute of Science, Bangalore, and the Harish Chandra Research Institute, Allahabad, have only forayed into the theoretical aspects of quantum computing, a DST official said that “the time has come to build one.”

Experts from across the country are expected to gather this month in Allahabad for a workshop to develop such a computer. Internationally, Canada’s D-Wave Systems, is a pioneer in developing quantum computers and has sold machines to Lockheed Martin and Google.

Experts, however, say that ‘true quantum computers’ are still years away, and existing systems use principles of quantum

computing to solve very limited problems.

Source: xaam.in

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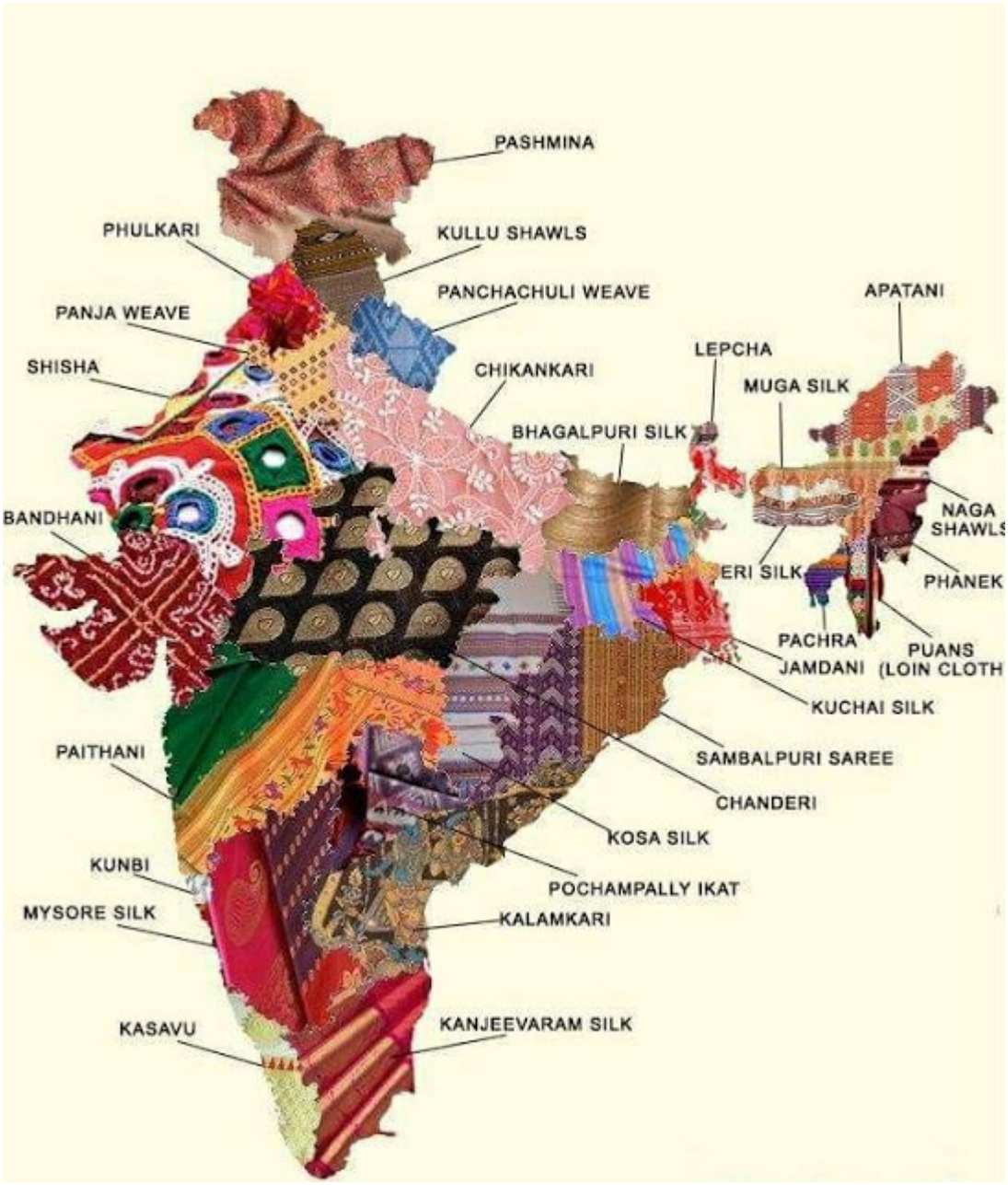

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