earthquakes on 18 June 2000 (*Mw* 7.8), 11 April 2012 (*Mw* 8.6 and 8.2), and the recent earthquake on 2 March 2016 (*Mw* 7.8). Because of the largely horizontal motion on the fault planes during these earthquakes, causing no or small vertical displacement of the sea floor, fortunately none of these earthquakes caused any significant tsunami. The earthquakes in the diffused plate boundaries are found to break the plates through their complex ruptures, like a weak but highly stretched trampoline being shattered by a jumping gymnast. On a shorter timescale, these individual earthquakes represent the process of strain release which accumulated over several hundreds of years, but on longer timescale they represent the process of plate tectonics which operates over millions of years.

Such snapshots from the evolution of a plate bundary are rare, as we are usually exposed to the cumulative outcome of such processes that operated in the past. Thus, what happens in the central ocean is akin to the blink of an eye, a brief history in the development and growth of plate margins.

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The exclusion zone of Narora Atomic Power Station – a control hothouse

A nation's development and prosperity goes hand in hand with its capacity to generate renewable sources of energy through power generation, which is crucial to balance the depleting natural resources. However, regions with Nuclear Atomic Power Station (NAPS) are often perceived to be infiltrated with toxic emissions percolating in their water reservoirs and atmosphere, which may be detrimental for all life forms in the vicinity. A botanical trip was conducted to NAPS at Narora (Figure 1) while carrying out survey and plant collection of the Upper Ganga Ramsar Site in Uttar Pradesh, India. This riverine Ramsar Site extends along 85 km stretch of the River Ganga beginning at Brij Ghat in Ghaziabad district and ending at Narora in Bulandshahr district, passing through the Budaun and Moradabad districts.

The NAPS is located at 28°09′N and 78°24′E, and at 169 m in Narora village block within the tropical climatic belt. During atomic power-generation process, the superfluous radiations are passed through high-efficiency filters (HEPA) for removing obnoxious contents inside the premises itself and then through 143 m high stack which dilutes the remaining traces of radioactive particles after HEPA filters. The filtered gases are finally released and dispersed in the atmosphere. The core zone of the atomic power plant is further encircled by a green-belt exclusion zone of 1.6 km radius, with exceptionally dense tree canopy, which is helpful in augmentation of the atmospheric oxygen content and hence functions as 'control enclosure' with its rich flora and fauna.

Figure 1. The NAPS at Narora towers with peripheral exclusion zone. A pair of Indian skimmers can be seen in the foreground.

Figure 2. Bird congregation in NAPS precincts.

The tree canopy comprised of species such as *Ficus benghalensis* L., *Ficus religiosa* L., *Azardirachta indica* A. Juss., *Acacia nilotica* (L.) Willd. ex. Delile, *Aegle marmelos* (L.) Correa, *Phyllanthus emblica* L., *Tectona grandis* L. f., *Cassia fistula* L., *Dalbergia sissoo* Roxb., *Albizzia lebbek* (L.) Benth., *Alstonia scholaris* (L.) R. Br. and *Bauhinia variegata* L. Through this compact tree cover sunlight could not reach the ground even during bright sunny days; hence the survey was made possible only with the help of headlights of our vehicle. Photography and plant collection, however, were not permitted. The second vegetation tier comprised of shrubs, among which *Ziziphus oenoplia* (L.) Mill., *Lantana camara* L. var. *aculeata* Moldenke. and *Prosopis juliflora* (Swartz) DC. were so dominant that they almost eclipsed the herbaceous flora. Climbers such as *Abrus precatorius* L., *Cocculus hirsutus* (L.) Theob, *Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thoms., *Coccinia grandis* (L.) Wight, *Ampelocissus latifolia* (Roxb.) Planch, *Hemidesmus indicus* (L.) R. Br., *Cissampelos pareira* L. var. *hirsuta* (Buch. - Ham. *ex* DC.) Forman and *Dioscorea bulbifera* L. spread all along the forest patch. The herbs were primarily *Sida rhombifolia* L., *Desmodium triflorum* (L.) DC., *Desmodium gangeticum* (L.) DC. *Adhatoda zeylanica* Medik, *Biophytum sensitivum* (L.) DC., *Senna tora* (L.) Roxb., *Senna occidentalis*, *Abutilon indicum* (L.), *Tridax procumbens* L., *Euphorbia hirta* L. and *Ageratum conyzoides* L. There were 4–5 small water reservoirs and a pond with the common aquatic and marshy vegetation of *Eichhornia crassipes* (Maxt.) Solms, *Hydrilla verticillata* (L.f.) Royle, *Potamogeton crispus* L., *Marsilea minuta* L., *Sesbania bispinosa* (Jacq.) W.F. Wight, *Scirpus tuberosus* Deaf., *Polygonum glabrum* Willd., *Ceratopteris thalictroides* (L.) Ad Brongn., *Scirpus articulatus* L., *Ammannia baccifera* L., *Bacopa monnieri* (L.) Wettst., *Centella asiatica* (L.) Urb., *Phlya nodiflora* (L.) Greene, *Typha angustifolia* L., *Ipomea aquatica* Forssk., and *Alternanthera sessilis* (L.) R. Br. ex DC.

The faunal constituents included populations of Indian wild boar (*Sus scrofa cristatus*), hare (*Lepus nigricollis*), blue bull (*Boselaphus tragocamelus*), deer (*Axis axis*), jackal (*Canis aureus indicus*), porcupine (*Hystrix indica*), rhesus monkey (*Macaca mulata*), Indian grey langurs (*Semnopithecus hectar*), several species of frogs, turtles, tortoise and birds, both resident and migratory, snakes, lizards, etc. Occurrence of some Red-listed and rare birds (Figure 2) – the Indian skimmer (*Rynchops albicollis*), sarus crane (*Grus antigone*)[1], Indian darter (*Anhinga melanogaster*), river tern (*Sterna aurantia*), Egyptian vulture (*Neophron percnopterus*), river lapwing (*Vanellus duvaucelii*), red kite (*Milvus milvus*), curlew (*Numenius arquata*), black winged kite (*Elanus caeruleus*), common Indian kestrel (*Falco tinnunculus*) were characteristic while tigers were also sighted at times by the staff of NAPS.

The exclusion zone of NAPS therefore acts as an ideally rich conservatory of coexisting wild flora and fauna in natural environment, an exemplary hothouse of rare avian faunal elements which authenticate the 'Important Bird Area'[2] status of Narora, while survival of the unscathed life forms implicates absence of any detrimental traces of radiation by-products into the atmosphere. The exclusion 'control zone' of NAPS, Narora evidently portrays an environmental buffer model for all power stations.

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