COVID-19 imposed lockdown might be a boon for aquatic ecosystem

Due to the pandemic outbreak of COVID-19, like other countries, India also issued a lockdown notification from 24 March 2020 to break the chain of virus transmission at community level[1]. Though it is a bane to human health howbeit might be a boon for aquatic ecosystem. Even though strict rule has been imposed by the pollution control board, most of the industrial effluents containing heavy metals and other obnoxious chemicals often end up into the aquatic ecosystem and exert an enormous damage to aquatic food chain through bioaccumulation to biomagnifications. As most of the industries are closed during this lockdown period, it might have a positive culminating effect to the system. Moreover, the emission of greenhouse gases and particulate matter concentration have also been reduced drastically during the lockdown period due to decreased coal-based power generation, restricted automobile use and complete arrest in public transport[2]. Studies have shown the detrimental effect of heavy metal toxicity on the physiology of fish and morphological deformities of their larvae[3,4]. This lockdown period is turning out to be a rare opportunity to revive aquatic ecosystem especially capture fisheries as most of the fishing activities are now completely stopped due to plummeting demand by the restaurants, hotels and seafood export; which might have increased the plausibility for survival of gravid female fishes unlike other years. From the last couple of decades, to support the increasing demand of market, coastal fishing activities have increased manifold. Nevertheless, strict rule imposed by the government authorities against catching gravid female and juvenile fishes albeit unauthorized/unreported fishing activities continues. As a classic example, economically important anadromous fish like *Tenualosailisa* (commonly known as *Hilsa*) initiate upstream migration from marine to freshwater realm during May at river Brahmaputra and onset of monsoon at the Hooghly–Bhagirathi system, the component of Ganga river for major spawning and are often caught in illegal small meshed gears used by the fishermen[5]. Besides for another minor peak spring, spawners enter the river in January–March and return to the sea during July–August[5,6]. Seemingly not only for brooder but also for the offspring and juveniles this lockdown could be a blessing and might be a substantial replenishment to the dwindling fish stock. If this lock down period is further extended, it will have a potential impact on the marine ecosystem too. Historically, studies have shown a spectacular recovery of fish landing after the Second World War due to the pause in commercial fishery[7]. It is expected that unintended lockdown might escalate the recovery of fish stock and act as a potential tool for conservation purpose. In a tropical country like India, most of the aquatic animals' breeding period synchronized with monsoon season[8]. Furthermore, ceased tourism pressure has also provided aquatic animals an undisturbed and pollution-free environment as shown by return of flamingos in Navi Mumbai, successful mass nesting of olive ridley turtle in Odisha's Rushikulya rookery and reappearance of Gangetic dolphins in Bihar during the lock down period[9–11]. Finally, there might be a silver lining amongst all the gloom and doom due to corona pandemic. Although aquatic ecosystem might rejuvenate itself and would return mankind with successful fisheries and healthier environs in coming years, it might only be a short-term gain.

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Beehive charcoal briquettes: clean cooking fuel for rural households

Cooking is the major energy-intensive activity in many households of rural India[1]. A significant number of rural households still depend on biomass for cooking fuel due to easy access, socio-political situation, age-old cultural practice and low income[2]. The Ujjala Yojana of the Government of India had provided LPG connection to 80 million households, but the second and consecutive fillings are less common[3]. Use of fuelwood for cooking has serious health implications especially for women and children due to indoor pollution[4]. On an average a woman spends 3 to 4 h per day for

Figure 1. ***a***, A 200 l oil container charring drum; ***b***, beehive briquetting mould; ***c***, metallic stove; ***d***, burning beehive briquette.

collecting firewood from the forest, which she could otherwise have spent on more productive activities. Considering this fact, efforts have been made to introduce improved cookstoves as an alternative to LPG, but the transition is not satisfactory[2]. Hence, there is an option for alternate cooking fuel using biomass available in the near vicinity.

Beehive briquettes are charcoal briquettes made from char and clay mud mixed in certain proportion (Figure 1). Mud acts mainly as a binding agent and reduces the rate of burning. These briquettes are circular in shape having a diameter of 150 mm and height of 85 mm with around 21 holes of 10 mm diameter. Due to the holes it looks like a beehive; thus the name 'beehive briquette'. Dried beehive briquette produces smokeless blue flame during burning for 2.5–3 h. It can be burnt in a simple metal stove generally used for biomass burning with an efficiency of approximately 25–35%. The briquette is ignited by a small fire below by using dried woodchips. Once the briquette catches fire at the base, the fire spreads uniformly and propagates upward. It can be used for cooking and space heating of rooms. This is an eco-friendly, alternative clean source of household fuel to save electricity and fuel wood. Emission of harmful gases from burring briquette is very low compared to wood and woody biomass. The calorific value of this briquette is approximately 18–20 MJ/kg, and emission of CO, CO_2, CH_4, NO and NO_x ranges between 0.05–0.1%, 0.1–0.5%, 100–200 ppm, 0.5–3.0 ppm and 0.5–3.5 ppm respectively, which is well within the permissible limits[5].

The primary raw material required for this briquette is charcoal, which can be made from crop residues or any biomass grown in nearby fields and rural houses. Charcoal can be prepared by partial carbonization of biomass residues like wood, saw-mill waste, forest biomass like leaves, twigs and agricultural residues like maize stalk, pigeon-pea stalk and weeds. A 200 l used oil drum can be utilized as a charring drum after incorporating a gas-sealing lid and a chimney. The cheapest binding agent used for this briquette is soft mud. Dry soil dominant in clay content can also be used after mixing it with water. The beehive briquetting mould is made of mild steel. The mould consists of a base plate of 5 mm thickness with 21 iron pegs of 12 mm diameter, a perforated pressure plate and a cylinder of 85 mm diameter. It is simple to fabricate and easy to use. With available crop residues from the farmers' fields, this briquette can be made in the rural households at almost negligible expenses.

Equal amount of crop residues is produced in crops like cotton, maize, soybean, pigeon pea, chickpea, etc. These crop residues can be converted to char with a recovery rate of 25–35% depending on the process employed[6]. For making one briquette, 300 g of char is needed and one briquette is sufficient for making one meal for a family of four members. Thus, beehive briquettes can cater to the need of rural women to some extent by providing clean cooking fuel.

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