

Vol III Issue IX March 2014

Impact Factor : 2.2052(UIF)

ISSN No :2231-5063

# International Multidisciplinary Research Journal

## *Golden Research Thoughts*

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**RNI MAHMUL/2011/38595**

**ISSN No.2231-5063**

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## SPATIO-TEMPORAL ANALYSIS OF TIGER POPULATION IN INDIA

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**Abstract:-**Accelerating deforestation, rampant poaching and mining is leading to habitat destruction of wildlife animals especially carnivore's animals like Tiger, which is further aggravating the problem of man-animal conflict. So that's why The tiger population in world and India has been decreasing at an alarming rate over the past 100 years, with 40,000 wild tigers roaming the landscape in the early 20th century, to only 1,700 dotting the landscape today. Meanwhile India government has made great strides recently to protect tigers and increase population numbers through tiger reserves, punishing poachers with imprisonment and fines, and through effective patrolling strategies. In this paper more and more focus on what is scenario is going on regarding with tiger population. As well as the discussed issue, history, scientific characteristic, habitat and distribution, diet, threat and conservation of tiger management. In this paper major focus on spatial temporal analysis in tiger population in India.

**Keywords:** Panthera Tigris, Felidae, Harappan, National Tiger Conservation Authority, Wildlife Crime Database

### 1. INTRODUCTION:

The tiger, one of the most magnificent animals in the world, is also one of the most endangered species in the world. A cat of beauty, strength, and majesty, the tiger is master of all and subject to none except humans. Of the eight original subspecies of tigers, three have become extinct within the last 60 years and there are less than 50 South China tigers left on this planet few and possibly none survive in the wild. Tigers increasingly compete with expanding human population and industry for land and food, and many are killed by poachers who sell their skins and body parts as ingredients for traditional Chinese medicines. If these trends continue, the wild tiger may evolve from being an endangered species and off the endangered species list to become an extinct species.

One of the earliest portrayals of the tiger in India is found in the Harappan seals from the Indus valley culture, dating back to 2500 BC, and depicting an intricate association between people and tigers. The rock paintings of Warli tribe, which date back to around 3000 BC, also feature the tiger. It is believed that tigers evolved in northern China and Far East Asia approximately two million years ago. They then migrated through woodlands and along river systems into southwest Asia. In the south and southeast directions, tigers moved through continental Southeast Asia, crossing into the Indonesian islands before they separated from mainland, and finally reached India. But now-a-days some tiger are remaining in whole world.

### 2. STUDY AREA:-

The study an area covers of 3.28 million sq km. The main extends between 8° 4' N and 37° 6' North Latitude and 68° 7' and 97° 25' East Longitudes. The Tropic of Cancer 23° 30' N divides almost into two halves. The land frontier of the 15, 200 km and the total length of the coastline is 7, 517 km. This study an area is fully cover of Royal Bengal tiger is found primarily in India with smaller populations in Bangladesh, Nepal, Bhutan, China and Burma. But mainly focus on India.

### 3. RESEARCH METHODOLOGY:-

In the present paper of methodologies, we address the application of spatial temporal analysis for tiger population in India. The target population for a survey is the entire set of units for which the survey data are to be used to make inferences. Thus, the target population defines those units for which the findings of the survey are meant to generalize. Establishing study objectives is the, first step is what is crisis is going on tiger population. Defining the target population should be the second step, Major database for this paper is collected from primary as well as secondary sources, The Ministry of Environment and Forests (MoEF), National tiger conservation authority, Project Tiger and WWF India.

### 4. RESULT AND DISCUSSION:-

The Royal Bengal tiger (*Panthera tigris tigris*), the national animal of India is an incredible sight. The Bengal tiger (also known as the Royal Bengal tiger) is a subspecies of tiger, found across the Indian subcontinent. The Royal Bengal Tiger is a super predator and important member of the carnivores that once roamed and dominated all of South East Asia. Today, due to habitat loss caused by deforestation, and hunting by human poachers, the Bengal tiger is considered to be an endangered species. Despite being the most common of all the tiger species, there are thought to be around 2,000 Bengal tigers left in the wild (Figure 1).

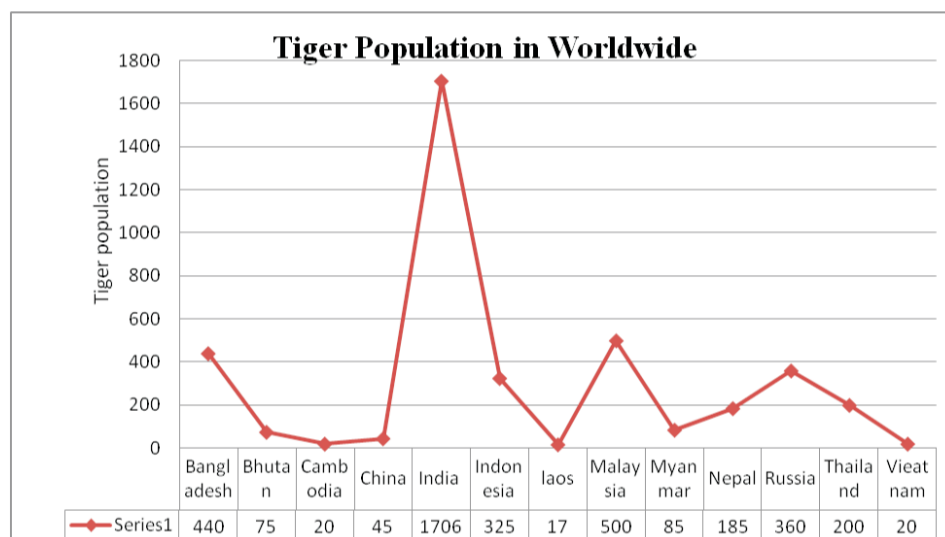


Table 1, Scientific Name

<b>Scientific Name:-</b>	<i>Panthera Tigris,</i>
<b>Class:</b>	<i>Mammalia,</i>
<b>Order:</b>	<i>Carnivora,</i>
<b>Family</b>	<i>Felidae</i>

#### 4.1. SIZE AND PHYSICAL CHARACTERISTICS:-

The tiger (*Panthera tigris*) is the largest among all the living wild cats of the family Felidae. It has an elongated body, short neck, and compact head with a relatively short muzzle. The legs are stout and the paws are armed with retractile claws. The total body length of an adult male tiger is between 275-290 cm and that of an adult female is 250-260 cm. The adult male tiger weighs 180-260 kg whereas the adult female weighs 100-160 kg. Tigers have a reddish-brown to rust-brown coat with black stripes and a white underbelly. Variations in coat colouration occur among individuals. White and black tigers are caused by a recessive gene.

Table 2, Subspecies:-

Bengal Tiger	<i>Panthera tigris tigris,</i>
Siberian (Amurian) Tiger	<i>Panthera tigris altaica</i>
Sumatran Tiger	<i>Panthera tigris sumatrae</i>
Indo-Chinese Tiger	<i>Panthera tigris corbetti</i>
South China Tiger	<i>Panthera tigris amoyensis</i>
Javan Tiger	<i>Panthera tigris sondaica</i>
Bali Tiger	<i>Panthera tigris balica</i>
Caspian Tiger	<i>Panthera tigris virgata</i>

#### 4.2. HABITAT AND DISTRIBUTION:-

In India, the tiger is found practically throughout the country, from the Himalayas to Cape Comorin, except in Punjab, Kutch and the deserts of Rajasthan. In the northeast, its range extends into Burma. Tigers occupy a variety of habitats including tropical evergreen forests, deciduous forests, mangrove swamps, thorn forests and grass jungles.

#### 4.3. BEHAVIOURAL CHARACTERISTICS:-

Tigers are usually solitary, except for females with cubs. They are territorial and males have discrete territories overlapping those of several females. Male territories are mate oriented while those of females are more resource oriented. Tigers use scent (spraying urine on the trees or other vegetation or deposited on a scrape), scratch marking on tree trunks with claws and scrape marks on the ground to maintain contact and advertise their presence to others.

Males associate with females for breeding and have been observed with females and cubs when feeding and resting. Although tigers mate and produce cubs throughout the year in India, peak breeding activity is in winter and early summer. During breeding, which lasts about 20 to 30 days, males and females communicate with each other with loud and distinct calls that travel great distances. About 8 different kinds' vocalizations have been documented in tigers from the wild. The gestation period is about three months (90 days). The litter size may vary between 1-6 cubs, but 2-3 cubs are most common. At birth, the tiger cub weighs between 800-1500 grams and measures 31-40 cm in length. Cubs stay with their mother and siblings until about the age of two when they move on to establish their own territories. During these two years, cubs learn hunting techniques from their mother.

Tigers are well adapted to stalking prey rather than running it down. Tigers primarily hunt at night, between dawn and dusk and usually rest during daytime. On an average, tigers and tigresses without cubs kill once in eight days, whereas a tigress with cubs makes kill almost once every five days. However, the rate of kills depends on the number of successful attempts. The prey is killed mostly by a fatal throat bite causing suffocation, strangulation or severance of blood vessels. Sometimes nose bites are applied to suffocate the animal, when an effective throat bite is not an easy task, mainly in case of larger prey. Small prey is killed by a nape bite resulting in broken neck vertebrae or dislocation of head from vertebral column.

#### 4.4. DIET:-

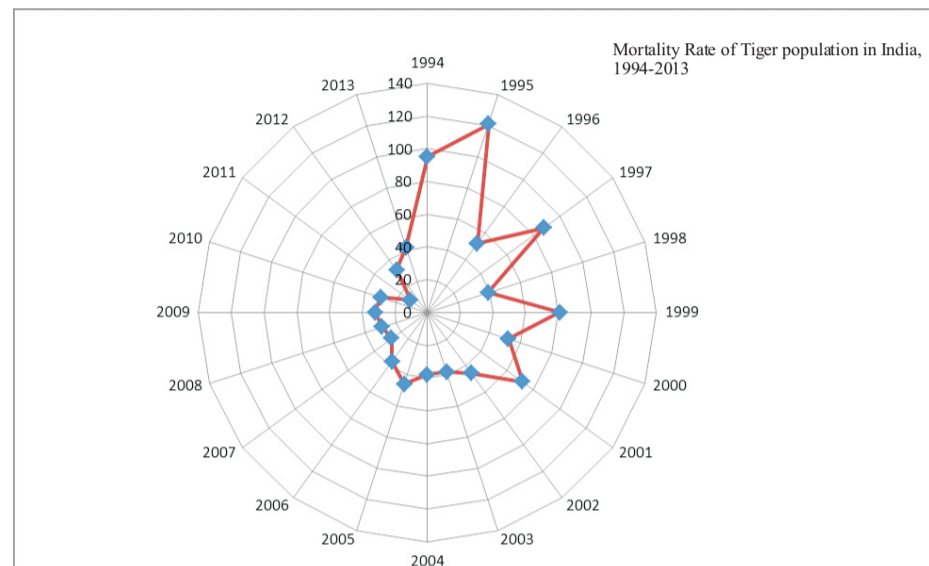
Tigers are meat eaters. Their diet includes chital, sambar, gaur, barasingha, hog deer, barking deer, nilgai, pigs and cattle. Apart from large prey, tigers are also known to consume birds like peafowl and large rodents like porcupines. They are even known to attack elephants and rhino calves. Tigers in the Sundarbans are known to feed on fish and crabs.

#### 4.5. THREATS:-

The tiger population in India is officially estimated to be between 1571-1875, many of the tiger populations across the nation, particularly those outside protected reserves, face a variety of threats, including habitat fragmentation, encroachment, and poaching and developmental projects. These problems are directly or indirectly linked to anthropogenic factors. Decades of scientific research on tigers and their prey have provided us with a set of guidelines to develop and design protected areas to help the species survive. However, these reserves protect only a fraction of tiger habitat, and most are under

#### 'Spatio-temporal Analysis Of Tiger Population In India

severe human pressure. In the last few years, tiger poaching has increased dramatically, fuelled by illegal trade in tiger body parts. Large development projects, such as mining, we can see in this figure how tiger mortality rate rapidly change in tiger population in India from 1994 to 2013 (Figure 2).



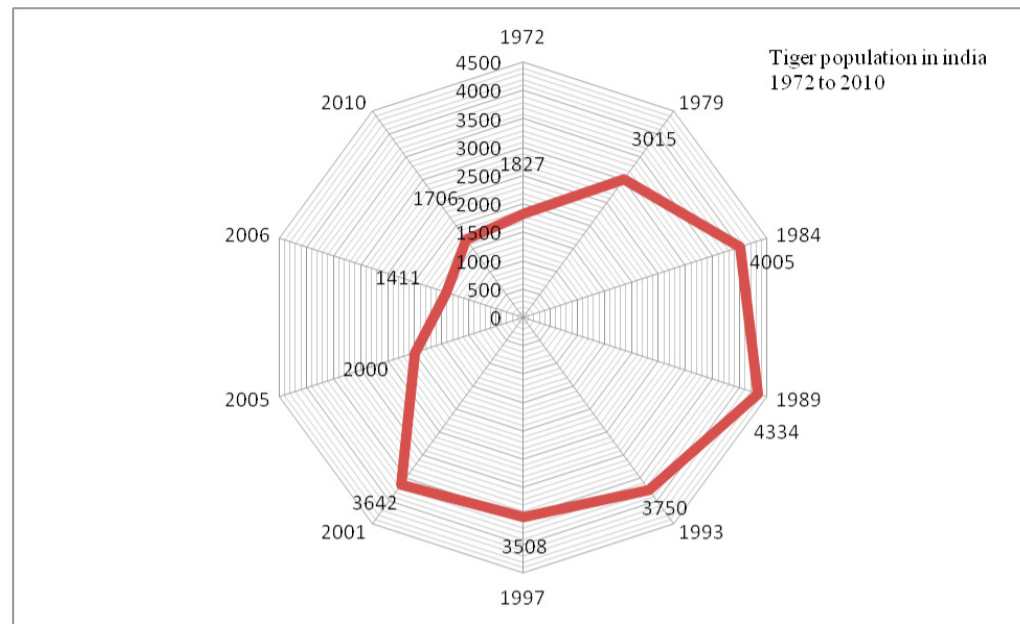
Hydroelectric dams and construction of highways are also taking their toll on the tiger's habitat. In the past few years, thousands of square kilometres of forestland have been diverted and destroyed to facilitate such projects. Though mostly outside the protected network, the loss of this vital habitat will have serious repercussions on tiger conservation in India. WPSI's Wildlife Crime Database shows 95 tigers are known to have been killed in 1994, 89 tigers were killed in 1997, 36 tigers were killed in 1998, 72 tigers were killed in 2001 and 35 tigers were killed in 2003. These figures, however, are incomplete and represent only a fraction of the actual poaching activity in India.

As climate change continues to warm the planet, tigers are feeling the heat. As we see ocean levels rise, tigers are losing habitat due to coastal erosion in areas like India's Sundarban islands. As rising sea levels claim more habitat and sea water moves up river, naturally fresh water is becoming more saline, or more highly concentrated with salt. These factors are forcing the tigers to move northward towards areas more heavily populated by humans and increasing the likelihood of animal/human conflicts. Tigers are also facing many other threats. They are illegally killed or poached because their pelts are valuable in the black market trade, their body parts are used in traditional Asian medicines and they are seen as threats to human communities. There is also large scale habitat loss due to human population growth and expansion. Human encroachment into tiger habitat also decreases prey animals.

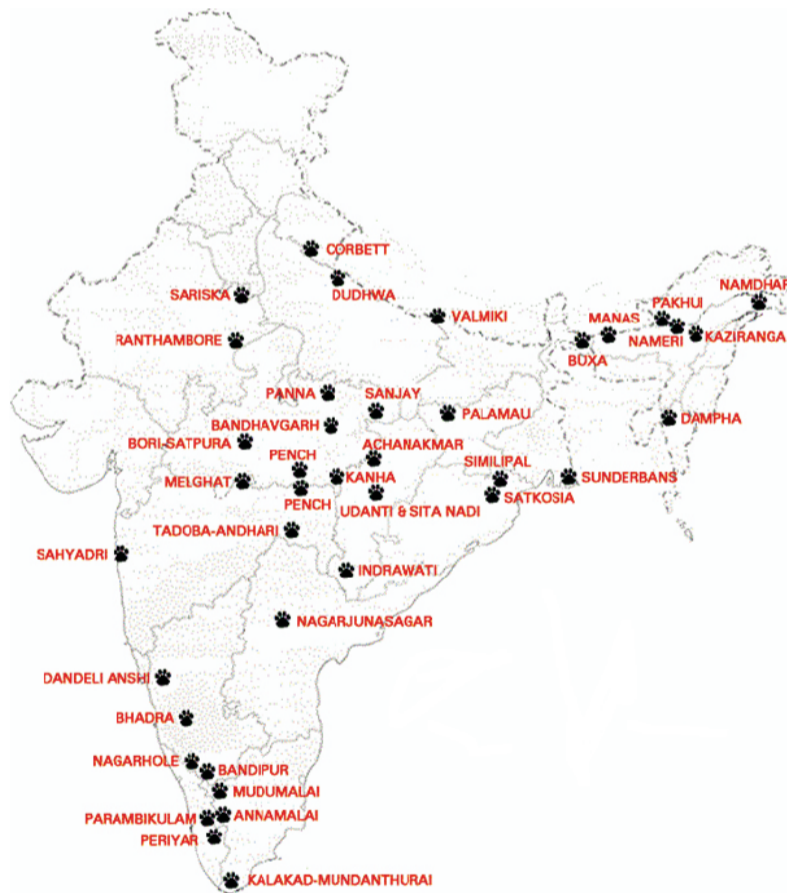
#### 4.6. CONSERVATION:

Project Tiger was launched in India in 1973, with the goal of saving the tiger and its habitat in India. With an initial list of 9 Tiger Reserves, this Project went on to cover 28 Tiger Reserves across the country, incorporating an area of 37,761 sq. km. Though this Project tackled various issues over the past 20 years, it had not been able to keep pace with the rapid changes that have changed the tiger landscape and increased human pressures. In 2006, it was replaced by the National Tiger Conservation Authority. Despite all these problems, India still holds the best chance for saving the tiger in the wild. Tigers occur in 18 States within the Republic of India, with 10 States reportedly having populations in excess of 100 tigers. There are still areas with relatively large tiger populations and extensive tracts of protected habitat. We need to make a concerted effort to combat poaching and habitat loss, if this magnificent animal is to survive into the future. But in present time, there are 53 tiger reserves in India (2011) which are governed by Project Tiger which is administered by the National Tiger Conservation Authority. There are an additional six proposed and four approved in principle reserves that are not yet declared (Figure 3).

**Spatio-temporal Analysis Of Tiger Population In India**



Is tiger population is going on in critical situation in India? Yes, But now days it's great million rupees effort for tiger conservation through our government and us, so that's why big news to all big cats and as well as for us. We can see in this figure (1972 to 2010)



Source: Tiger project in India (2011), source- Save our Tigers.

#### **4.7. MANAGEMENT OF TIGER CONSERVATION:-**

The dynamics of forest management and wildlife conservation have been distorted due to need for income, lack of awareness, lack of land use policy and population pressure. Since the traditional use systems of people are neither static nor benign, these should not be overlooked. A regional development approach in landscapes having Tiger Reserves is of utmost importance in our country. It should be viewed as a mosaic of different land use patterns, as follows, tiger conservation /preservation, forestry, sustainable use and development, besides socio-economic growth. Tiger habitats exist in environments of thousands of indigenous communities which depend on them. Therefore we cannot view these protected areas in isolation from the surrounding socio-economic realities and developmental priorities of the Govt. This calls for a cross-sectorial and cross-disciplinary approach. Tigers now need a "preservationist" approach. Regional planning is important around Tiger Reserves to foster ecological connectivity between protected areas through restorative inputs with integrated land use planning. The management plan of a Tiger Reserve, therefore, needs to be integrated in larger regional management plans, as well as we should look into in all these appropriate action point for tiger conservation.

**Protect the Protectors:** Fill forest Guard vacancies within six months. Give forest guards better working conditions, the best leadership, equipment and training and restore foot patrols.

**Consolidate Tiger Reserves:** Notify buffer zones, protect corridors, stop large scale construction, mining, and damaging projects in and around tiger reserves, divert new highway alignments away from core/critical tiger habitats and restrict traffic from dusk to dawn in existing ones.

**Resettle Villages from core/critical tiger habitats:** This should be quick, fair and voluntary..

**Compensate livestock deaths quickly:** Work with NTCA-recommended independent NGOs to certify eligibility. Make quick and fair payments to prevent poisoning of carcasses.

**Crackdown on poaching:** Follow up tight patrolling with speedy convictions and levy punitive spot fines and seize vehicles of offenders.

**Declare tiger reserve buffers as Green Economic Zones (GEZ):** All adults living OUTSIDE, within 10 sq km of critical and core critical tiger habitats to be offered livelihoods based on the restoration of the habitat.

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