

**Interim Report II of the Expert Committee constituted by Hon'ble Madurai Bench of Madras High Court in the case of WP(MD) No. 3633/2014, 13763/2016 & 7606/2017 relating to the issues of exotic plantations invasive alien species and restoration of Shola forests in Nilgiris of Tamil Nadu State.**

**INTRODUCTION**

As has been mentioned in the earlier Interim Report, the order of Hon'ble Madurai Bench of Madras High Court itself exhaustively reviewed the impacts of exotic plantations and invasive alien species on the ecology of Nilgiris and the degradation of Sholas . The expert Committee constituted by it met on 10th April 2019 at State Government Secretariat, Chennai.

Interim Report highlighted the issues , the ways and means to address the issues through field assessments and the expertise available within the committee for finding long-term sustainable solutions to the ecological problems prayed the court of Nilgiris in Tamil Nadu. In the Interim Report the Expert Committee prefer to extend the tenure of the committee and appoint an officer of the rank of Chief Conservator of Forests / or Divisional Forest Officer of the Tamil Nadu Forest Department as a nodal officer to coordinate the activities of the Expert Committee and facilitate the field visits to the different sites for assessment of ground reality.

The Hon'ble Madurai Bench of Madras High Court passed an order on 4th July 2019, wherein it was directed " The Secretary to Government , Forest Department , Fort St-George, Chennai -600001 to facilitate field visits of the committee" and "the committee is at liberty to have further sittings" , and also " to appoint a nodal officer to facilitate the meetings at the level of the Additional Principal Chief Conservator of Forests ".

In the order , the court also requested " the Chairman of the committee to be present before this court on the next date of hearing to assist the court". The order also mentioned that "the earlier order passed with respect to the facility to be extended will have to be made applicable in the subsequent sittings".

## SECOND MEETING OF THE EXPERT COMMITTEE

The Chair man in consultation with the members held the second meeting at the Tamil Nadu , Government Guest House, Ooty on the forenoon of 20th August 2019 . The APCCF of Coimbatore circle facilitated the meeting and field visits. The meeting was attended by 5 members including one Amicus Curiae, authorized representative of one member , besides the APCCF of Coimbatore circle, DFO of Nilgiris, DFO of Kodaikanal, Deputy Director Mudumalai, DFO of Gudalur, ACF of Coonoor. One member was away from India and two members regretted because of their prior academic commitments.

The APCCF welcomed the Chairman and members of the Expert Committee and requested DFO of Kodaikanal to present the activities undertaken in his range. The DFO highlighted the activities on the removal of wattle and *Lantana* from Sholas of Kodaikanal but pointed out that regeneration of the same species is rampant in weed free landscapes. secondary invasive of other species is very common . The DFO of Nilgiris also briefed the committee on the removal of wattle from some patches of grasslands and its regeneration on weed free landscapes and also reinvasion of *Chromolaena* and *Parthenium* . The DFO of Gudalur pointed and that there are massive coffee plantation with *Grivellia* as the shade tree and this tree has been invading the natural shola ecosystems . Wattle is a major menace in the sholas and the herbivores are often taken shelter under wattle cover.

The Deputy Director of Mudumalai spoke about the massive invasion of *Lantana* and *Senna specabilis* in the deciduous and moist deciduous forests of buffer and core areas. She also spoke about secondary invasions of *Chromolaena*, *Perilla*, and *Parthenium* on the weed free landscapes . The invasion of *Opuntia* is a serious threat to deciduous forests.

The Amicus Curiae pointed that the court is keen to restore the sholas and other weed infested ecosystems of Nilgiri ranges of Tamil Nadu . The Expert Committee should formulate strategies and action plans for addressing the two issues- exotic plantations and invasion of alien species - that are threatening life supporting ecosystems of Nilgiri ranges .

The APCCF of Coimbatore circle mentioned that the Department of Forests , Government of Tamil Nadu has been undertaking activities like removal of wattle and *Lantana* from sholas and other forest types but the magnitude of the problem is high and reinvasions are very common.

The Chairman and members interacted with officials on the presentations made and suggested as approaches for removal of exotics and invasive alien species and restoration of shola forests and suggested that involvement of ED and NGO are critical in implementation of action plans.

### **FIELD VISITS TO SHOLAS OF OOTY DIVISION**

The Committee visited sholas of Ooty division in the afternoon of 20th 2019. The DCF of Nilgiris took the team to the following sites in and around Ooty.

- (I) Natural shola with undistributed forest in the valley and grasslands on the top of hill
- (II) Eucalyptus , Pine, and wattle plantations on grasslands .
- (III) Wattle invaded grasslands and shola forests.
- (IV) Tea plantations
- (V) Marsh grassland
- (VI) Wattle eradicated but reinvaded grassland
- (VII) Wattle eradicated patch with slow regeneration of grasslands
- (VIII) Reinvaded patch after eradication of wattle
- (IX) Beetroot and Reddish cultivated fields on the steep slopes
- (X) Sites where massive landslides took place

### **OUTCOMES OF THE FIELD VISIT**

The major outcomes of the field visit and discussion with field staff are as follows:

- (I) The shola vegetation has become relict in Ooty Nilgiris and may vanish soon as a result of exotics and tea plantations. This will result in loss of water sources.
- (II) The loss of sholas, which are equivalent to Himalayan glaciers, may result in heavy reduction in stream flows leading to severe water crisis in plains.
- (III) The loss of grasslands and shola forests is also leading to massive landslides.

- (IV) The wattle is replacing grassland and shola forests. The plantations of *Eucalyptus* , pines and cupressus have virtually wiped put grasslands and sholas. The massive tea gardens also replaced shola vegetation
- (V) The terrace cultivation of vegetables on steep slopes has also led to massive landslides
- (VI) The vegetation in and around Ooty is a weed community of naturalized alien species and replaces native shrubs and herbs.
- (VII) Dr Bosco has developed a excellent grass nursery of shola grasslands and also nursery of 53 tree species of shola forest. This nursery facilities can be expanded and should be utilized for restoration of degraded shola forest and grasslands.

## **FIELD VISIT TO BUFFER AND CORE AREA OF MUDUMALAI NATIONAL PARK .**

Field visits were undertaken in the following areas of Mudumalai Tiger Reserve on 21<sup>st</sup> August 2019:

1. Singara Range which falls under the Buffer area of the tiger reserve.
2. Masinagudi Range which falls under the Core area of the tiger reserve.
3. Kargudi and Theppakadu Ranges which fall under the Core area of the tiger reserve.

During the visit, the DFO of Nilgiris, The Deputy Directors (buffer and core areas of Mudumalai Tiger Reserve) accompanied the team.

## **OBSERVATIONS**

### **A. Overall extent of invasion by exotic species**

1. The buffer area of MTR is around 369 sq km and the core area is around 321 sq km, adding up to 690 sq km.
2. Overall, the forest department estimates that the area under invasion by alien species is about 60%.

### **B. Observations in the Buffer areas**

The buffer areas harbour predominantly tropical thorn (scrub) forests, with some areas having dry deciduous forest type. The profile of invasion by invasive alien species is as below:

- a. *Lantana camara* is widely present but the invasion is not intense or dense in comparison to the core areas. The population consists mostly of smaller sized bushes appearing as individuals (not dense patches), which are easier to remove. This can be classified as Low to Moderate invasion levels. There is also good presence of native vegetation represented by both shrubs and trees, which increases potential for revegetation after Lantana removal.
- b. *Opuntia stricta* is found to be actively invading parts of the buffer area, although the severity of invasion appears to be Low at present.
- c. *Chromolaena odorata* is widely present. Higher presence was observed in the areas adjoining the Masinagudi Range which are of dry deciduous type. In the scrub forests the presence was mostly under trees where the presence of grass is lower.
- d. *Parthenium hysterophorus* was observed in patches across the landscape.
- e. Presence of *Senna spectabilis* is lower than the core area and one can observe scattered presence. Initial studies indicate that the tropical thorn habitat is not preferred by *S.spectabilis* which is a moisture-loving species. However, these are early stages of *S.spectabilis* invasion in these areas and the possibility of the species adapting to drier areas in future cannot be ruled out.

### **C. Observations in Core areas**

The core areas consist of a mix of dry deciduous and moist deciduous forests. Almost 70% of the surveyed areas are under moist deciduous type. The profile of invasion by alien species is as below:

- a. *L. camara* is found in both the dry and moist deciduous forest types across all the Ranges surveyed. Density was moderate to high consisting of a large number of individual plants. We did not witness the very large clusters of *L. camara* as found in the adjoining Bandipur Tiger Reserve (clusters refer to where multiple *L. camara* bushes form one clump and are intertwined together and reaching heights of over 9 feet). However the forest department officials stated that such clusters were found in some areas. This distinction is important as removal of individual plants, even if they are close to each other, is far easier than removal of clusters.

- b. Intensive invasion by *C.odorata* was observed in the Kargudi and Theppakadu ranges, especially in areas where *L. camara* had been removed once and subsequent de-weeding or restoration had not been carried out.
- c. *S. spectabilis* was observed invading aggressively across Masinagudi Range, especially in low-lying areas. While sporadic occurrence was noted in Kargudi and Theppakadu Ranges.
- d. *P.hysterophorus* was observed across all Ranges, especially in areas where attempts to clear *L.camara* had taken place. However the presence and intensity is at a lower level as compared to *L.camara* and *C.odorata*.

#### **D. Impacts on native flora and fauna**

- a. Hardly any recruitment or regeneration of native tree vegetation was observed in the surveyed areas of the core area. There were no juvenile or sub-adult trees of the species of adult trees found in the area. This is of particular concern as any pest or fire attack on these adult trees will leave the forest bereft of any tree cover.
- b. There is practically no shrubs or herbaceous vegetation (under-storey vegetation) seen, as most of the ground area is occupied by invasive alien species.
- c. The insect and bird diversity was highly reduced in the forests ecosystems of Mudumalai.
- d. A large number of herbivores were feeding on the grasses appearing in the fire lines that are maintained on either side of the mud-roads inside the forest. These are areas that are cleared every year for fire prevention due to invasion of alien species which replaced under woods. Behind the fire lines one could observe a uniform “wall” of Lantana almost everywhere. We also observed herbivores feeding very close to the motorable roads where again the fire lines have some grass cover. It is apparent that the absence of adequate fodder was pushing the herbivores towards these areas.

#### **E. Efforts to manage the invasive alien species**

- a. The total area invaded by *L.camara* and areas taken up for restoration was explained by the Deputy Directors.
- b. *Lantana camara*
  - The methodology for removal of *L.camara*, which is being practiced, involves chopping off the top portion of the plant about 2 feet above the ground, burning the stump and thereafter pulling the roots out. This is carried out only during the

monsoon season when the ground is moist. This is a cumbersome, time-consuming and also ineffective way (as explained below) of removal that is limited to few monsoon months.

- We observed a number of *L.camara* branches scattered on the ground in the removed areas and the coppicing of the weed from these branches.
- The uprooted roots are piled up in lots and we could observe the weed coppicing from these as well.
- The effort is largely limited to removal of *L.camara* and efforts for post-removal restoration are minimal.
- However, some patches were found where the weed has been removed and the grass cover has come back naturally.
- The forest department confirmed that no mechanical equipment was being used for uprooting or grubbing the weed (see image below).
- Forest department's nurseries are mainly for a few tree species. Efforts to generate grass plant-material (seed collection, raising grass nurseries, etc) were not observed. No shrub or herb species were also observed in the nurseries and these need attention in future.

c. *Senna spectabilis*

A trial is being made by applying a concentrated salt solution after cutting the trunk of the tree at 3 feet height. We observed that the plant was coppicing after the salt treatment, particularly from portions where salt had not penetrated. It is also observed that it is impossible to ensure spread of the salt solution to all parts of the base of the tree up to the collar zone. Hence it seems unlikely that this method will succeed in removal of this species.

d. *Chromolaena odorata* and *Parthenium hysterophorus*

No attempts has been made to eradicate both the alien species.

e. *Opuntia stricta*

No attempts has been made to eradicate this alien species

## **SUGGESTIONS FOR THE CONTAINMENT OF INVASIVE ALIEN SPECIES**

- a. We understand a mapping of Lantana invasion has been carried out. It is recommended that the areas are also classified and mapped as Low, Medium and High invasion categories. It is recommended to remove Lantana in the low and high intensity areas first for two important reasons – firstly the presence of native vegetation notably grass around the Lantana bushes makes re-vegetation easier and faster, and secondly this would prevent invasions progressing to higher densities.
- b. As a priority, uninvaded areas to be earmarked and monitored to prevent invasion and tackle them in the early stages. This is also important to preserve reference ecosystems for future restoration benchmarking.
- c. A demonstration of the Cut Root-stock method of removing *L.camara* was carried out for the benefit of staff members of the forest department. The demonstration was done by a team of persons who have been removing *L.camara* using this method for the last 6 years in Bandipur Tiger Reserve. The benefits of this method in terms of efficiency in removal, low re-appearance of Lantana and minimal collateral damage to surrounding native vegetation were explained. It is recommended that this scientific and proven method of Lantana removal be standardized across Ranges.
- d. Removal of Lantana and secondary weeds needs to be ensured in the three to four subsequent years in order to exhaust the seed bank.
- e. In the case of *C.odorata*, the recommended removal method is manual uprooting of the plants in the early stages of invasion before a seed bank is accumulated. In places already invaded successive removal over two to three years would be needed.
- f. In the case of *P.hysterophorus*, the recommended removal method is to slash or cut the plant about 6 inches above ground level before the seeds become viable, and leave the plant to dry. A weed cutter can be used as well. The propagation of *Cynodon dactylon* and *Vetiveria* grass species is also helpful in controlling spread of *Parthenium*.
- g. Adequate level of post-weed removal restoration preparedness be created in the form of nurseries for native tree and shrub species, grass seed collection, grass nurseries, etc. be created on a top priority basis. These should focus on pioneer species that can grow well in the degraded soil and hydrological conditions prevalent in the Lantana removed areas.
- h. Effective methods to remove *Senna spectabilis* are yet to be identified as this is a relatively new invasion in India and trials are in progress. A presentation on different treatment methods trialed till now in Bandipur Tiger Reserve was made by Mr



Ramesh Venkataraman. These trials indicate that two treatments are recommended immediately i.e. pulling out of newly recruited seedlings and uprooting of juvenile plants using the Cut Rootstock method. This will help to control the spread of the invasion until an effective method to remove the sub-adult and adult trees is determined. However uprooting of sub-adult and adult trees, either manually or with JCBs, has been found to be ineffective as there is strong coppicing from root fragments and hence not recommended.

## CONCLUSIONS

Based on the discussions and observations made during field visits, the following are the major conclusions

- (I) The shola ecosystems have become relicts in Ooty division and these may soon extinct. This will have major impact on the water availability in the plains.
- (II) Massive exotic plantation (including tea plantation) on the grasslands and forests of sholas wiped out both grasslands and forest ecosystems of sholas.
- (III) Wattle invasion and reinvasion is rampant not only in plantations of Eucalyptus , Pines and Cupressus but also in forests and regenerated grasslands after removal of wattle.
- (IV) Massive landslides took place due to cultivation of vegetables and plantation on slopes after clearing native vegetation.
- (IV) *Chromolaena* is the major invasive alien species that invaded grasslands, plantations and wattle free landscapes.
- (V) The roadsides are completely occupied by an invasive alien weedy community replacing fruit bearing shrubs.
- (VI) The native tropical dry deciduous, moist deciduous and thorn forests and grasslands in Mudmalai National Park are threatened due to invasion of several invasive alien species of different life forms - trees (*Senna spectabilis*), shrubs (*Lantana*, *Chromolaena*, *Opuntia*) and herbs (*Perilla*, *Parthenium*).
- (VII) The invasive alien species prevented regeneration of forest ecosystems and eliminated native understorey vegetation and grasslands.

(IX) The forest Department has been attempting to manage the invasive alien species but with a little or no success.

(X) There is an urgent need to map the extent of exotic plantations and the extent of spread of invasive alien species and loss of grasslands in each forest division of Nilgiris.

This would enable to formulate strategies and action plans for the management of invasive alien species and exotic plantations and restoration of forest ecosystems.

(XI) To make the committee more effective, the two additional members may be included in the committee.

(i) Mr.Jagadish Krishnamoorthy,  
Hydrologist ATREE

(ii) Mr.R.Sundararaju IFS (Rtd),  
Former Chief Wildlife Wardern,  
Tamilnadu

(XII) Removal of exotics and invasive alien species and subsequent ecological restoration of weed free landscapes at the large landscape level requires well -knitted management structure and resources.