

Morphology of Pyramidal neurons of Medial hippocampus in *E. scolopaceus* and *P. krameri*



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Abstract : Hippocampus in birds is divided into five fields namely: medial hippocampus, lateral hippocampus, parahippocampal area, central field of parahippocampus and crescent field. The pyramidal neurons are the main subtype of neuronal classes in the medial hippocampus of birds. An attempt has been made to study and compare the morphology of pyramidal neurons in the medial hippocampus of *E. scolopaceus* and *P. krameri*. It was observed that pyramidal neurons of *E. scolopaceus* were more advanced in terms of soma diameter and dendritic field in comparison to *P. krameri* showing more networking of pyramidal cells in *E. scolopaceus*.

Key words: *E. scolopaceus*, *P. krameri*, Medial hippocampus, Soma diameter, Dendritic field

Introduction

Three layered medial hippocampus (HCm), a ventromedial part of hippocampus in birds has been suggested to be equivalent to Ammon's horn in mammals (Ariëns Kappers *et al.*, 1936; Montagnese *et al.*, 1996). It is one among the five fields of hippocampus in birds and has been differentiated into three visible layers namely: suprapyramidal, pyramidal and infrapyramidal layer (Srivastava *et al.*, 2007). The cell layers have been designated so because of the abundance of pyramidal neurons in the HCm region of birds. Montagnese *et al.* (1996) reported bitufted pyramidal neurons to be the only projection neurons in HCm of male zebra finch whereas Srivastava *et al.* (2007) observed pyramidal-like and multipolar neurons in addition to pyramidal neurons in HCm of *E. amandava* and favored the view that pyramidal cells were the main type of projection neuron in HCm of *E. amandava*.

The objective of present study was to study and adduce the morphology of pyramidal neurons of HCm in two different birds viz. *Eudynamis scolopaceus* and *Psittacula krameri*.

Materials and Methods

Three adult female (each) *E. scolopaceus* and *P. krameri* used in this study were collected from Allahabad (25° 28' N, 81° 54' E). Golgi-Colonnier method (Blaesing *et al.*, 2001) was employed for neuronal study. All the procedures were carried out according to institutional animal care guidelines.

Results

Pyramidal neurons were the most dominant type of neuron in HCm of *E. scolopaceus* and *P. krameri* (Fig. 1). The characteristics of pyramidal cells observed in the two birds are as follows:

1) *E. scolopaceus*: The medium sized triangular soma (diameter ranging from 19-25µm) gave rise to apical dendrite towards pia and two to three basal dendrites. The dendrites covered larger area (Table 1).

2) *P. krameri*: Thick apical dendrite of pyramidal neurons ran towards pia with finer basal dendrites radiating from the base of triangular soma. The soma diameter ranged from 18-20µm (Table 1).

The soma diameter and dendritic field calculated for female *E. scolopaceus* were greater than for female *P. krameri*.

Discussion

Regional specialization and differences in pyramidal cell structure may offer specific advantage for functioning of particular region i.e. HCm in present case. The soma diameter and dendritic field of pyramidal neurons in *E. scolopaceus* were observed to be larger in comparison to *P. krameri* (Table 1). The larger extent of dendritic arborization in *E. scolopaceus* indicates more networking of pyramidal cells allowing long-range connections in HCm of *E. scolopaceus*. The pyramidal neurons of *E. scolopaceus* and *P. krameri* share some common features (triangular soma, thick apical dendrite and finer basal skirt) with the neurons present in homologous structure of reptilian and mammalian telencephalon (Lacey, 1978; Guirido *et al.*, 1998). The differences lie in the distribution pattern and extent of dendritic arborization of pyramidal neurons of hippocampus of birds, reptiles and mammals.

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Table 1: Characteristics of pyramidal neurons of medial hippocampus in *E. scolopaceus* and *P. krameri*.

Characteristics	<i>E. scolopaceus</i>	<i>P. krameri</i>
Soma diameter(in μm)	19-25 μm	18-20 μm
Dendritic Field(in μm)	75-139 x 66-121	24-95 x 19-40
Percentage of pyramidal neurons observed in HCm region	63.49%	58.13%

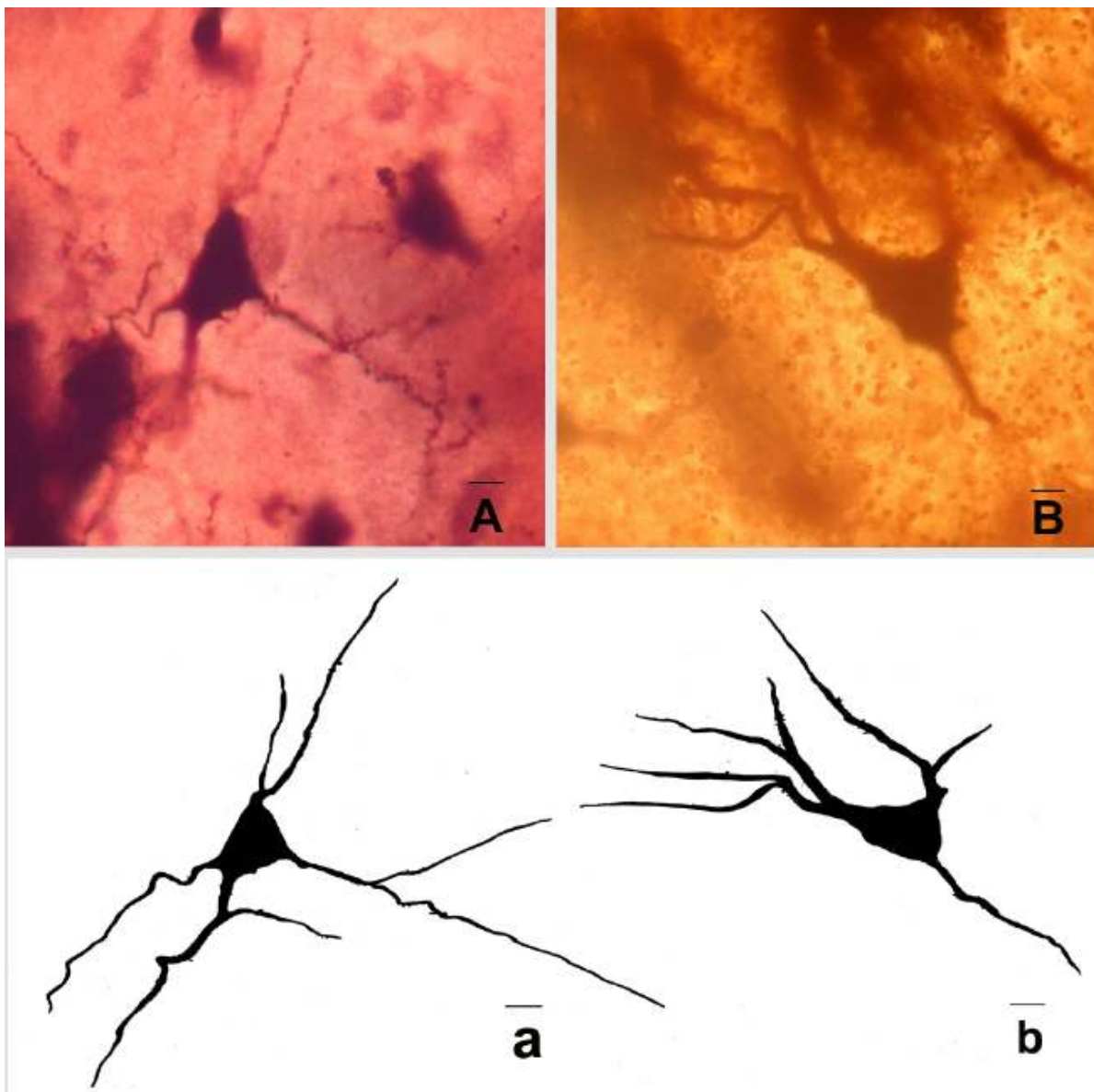


Fig. 1. Photomicrograph showing pyramidal neurons observed in medial hippocampus of (A) *E. scolopaceus*, (B) *P. krameri* and their respective camera lucida drawing. Scale bar = 10 μm .

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