Chapter 6

**SUMMARY**

A study of the central nervous system of *Herpestes javanicus auropunctatus* has been made in twenty adult animals (above 200 gm in weight). As in other mammals the central nervous system consists of the spinal cord and brain or encephalon, which are situated in the central axis of the body.

1. Spinal cord which is 15.5 to 21.0 cm in length, extends from the level of foramen magnum to the level of second sacral vertebra.

2. The spinal cord is divisible into 38 segments, comprised of 8 cervical, 13 thoracic, 7 lumbar, 3 sacral and 7 coccygeal. Each segment carries a pair of corresponding spinal nerves.

3. Anterior median fissure, posterior median, dorsolateral and ventrolateral sulci are present on the spinal cord.

4. Prominent cervical and lumbar enlargements are present which extend from fifth cervical to first thoracic segments and from third lumbar to seventh lumbar segments, respectively.

5. The proportions of grey and white matter and the percentage of grey matter to the total area of a section at various levels in the spinal cord have been described.

6. A successful attempt has been made to identify the ten
structural lamination of the spinal cord and its different nuclei in *Herpestes* as has been described by Rexed in the cat. All the ten laminae are recognised throughout the length of the spinal cord except lamina VI which is absent at the levels extending from second thoracic to second lumbar levels.

7. In addition to the usual nuclear columns, special columns like nucleus cervicalis lateralis, nucleus cervicalis centralis, Clarke's column, nucleus intermediolateralis and nucleus sacralis centralis have been described in the spinal cord.

8. A new nucleus named as the nucleus sacralis centralis has been recognized. A study of the literature reveals that this nucleus has not been described so far in any mammal by any worker.

9. Arterial supply of the spinal cord has been studied in detail. Blood is carried to the spinal cord by vertebral, intercostal and lumbar arteries. In the present work, it has not been possible to trace the deep cervical artery giving branches to the spinal cord as this artery is extremely small in this animal. These arteries finally give rise to the formation of three prominent longitudinal arteries which are, two posterior spinal arteries and a single median anterior spinal artery. In all there are 30 to 36 posterior radicular arteries and 16 to 18 anterior radicular arteries which reach the spinal cord. Variations in the number of radicular arteries in the different regions of the cord, studied
in three specimens, have been indicated. On either side the rostral-most appearance of anterior as well as posterior radicular artery is at the third cervical segmental level. The areas of supply in the interior of the spinal cord, (the grey and white matter) have been indicated.

10. The brain can be divided into prosencephalon (telencephalon and diencephalon), mesencephalon (midbrain) and rhombencephalon (pons, cerebellum and medulla oblongata).

11. The total weight of the brain is 6.40 to 8.10 gm, it is 3.71 to 4.30 cm in length and 2.03 to 2.18 cm in breadth, its volume is 6.30 to 8.00 cc.

12. As in other carnivora the cerebrum has a superolateral, medial and ventral surfaces.

13. Superolateral surface shows anterior and posterior rhinal sulci, part of cruciate sulcus, suprasylvian sulcus (anterior, middle and posterior parts), posterior ectosylvian sulcus, ansate and lateral sulci and the entolateral sulcus, whereas the medial surface shows the callosal, hippocampal, part of cruciate, lesser cruciate, splenial, posterior suprasplenial and the cingulate sulci. The inferior surface shows anterior rhinal sulcus and the inferior part of sylvian sulcus. The location and the extent of these sulci have been described.

14. Some important sulci which have been recognised in other
carnivora are not present on the cerebrum of this animal. These sulci include, coronal, anterior ectosylvian, rostral and genual.

15. The location and the extent of gyri on the cerebrum have been described and the various areas located. Due to the absence of the coronal sulcus, coronal gyrus cannot be identified. Moreover, due to the absence of anterior ectosylvian sulcus the rostral boundary of anterior sylvian gyrus cannot be located. The absence of these sulci results in topographic continuation of the anterior and posterior sigmoid gyri with the anterior and middle sylvian gyri and consequent absence of anterior ectosylvian gyrus.

16. Cytoarchitectonic structure of the cerebrum has been studied in six hemispheres (three of each side) belonging to different brains.

Depending upon the information available in literature the superolateral and the medial surfaces of the hemisphere were arbitrarily divided into 18 blocks each. On the basis of information gained by studying the serial sections of these blocks, the plan of making 18 blocks was modified so that seven to nine blocks in each of the remaining three hemispheres were made and considered adequate.

After the various areas had been established some frozen token sections were cut from the various areas of an another hemisphere.
Serial sections were stained with thionin or cresyl violet. Token frozen sections of the seventh hemisphere were stained with Bielschowsky's method.

17. A study of these serial sections has led to the identification of as many as fifteen different areas on the superolateral surface and nine on the medial surface of the cerebrum. The broad general plan has been found to be similar to that described in other carnivores.

18. In the frontal lobe of the superolateral surface, motor area, sensorimotor areas-I and II, area frontalis medium pyramidalis lesser granularis, area frontalis granularis medium pyramidalis and area frontalis granularis lateralis have been identified.

19. Sensorimotor area II and area frontalis granularis lateralis (on the basis of cytoarchitectonic structure) extend up to the sylvian sulcus and its projection extended upwards to the middle suprasylvian sulcus.

20. On the superolateral surface, the motor area is present as a strip along the caudal part of the cruciate sulcus in the posterior sigmoid gyrus and also extends a little rostrally beyond the free margin (lower) of the cruciate sulcus. This motor area also extends on to the medial surface in the rostral part of the gyrus cruciatus medialis.

21. The sensorimotor area-I is an extensive area present caudal to the motor area in the posterior sigmoid gyrus. This area too
extends on to the medial surface caudal to its motor area in the gyrus cruciatus medialis where it is named as sensorimotor area-III.

22. The sensorimotor area-II appears to be an inferior extension of sensorimotor area-I in the rostral part of middle sylvian gyrus and the dorsal part of the anterior sylvian gyrus.

23. Immediately rostral to the cruciate sulcus in the anterior sigmoid gyrus an extensive area called frontalis medium pyramidalis lesser granularis has been recognized.

24. Area frontalis granularis medium pyramidalis has been identified along the rostral border of the superolateral surface in the anterior sigmoid gyrus.

25. Area frontalis granularis lateralis is present in the inferior and the middle part of the anterior sylvian gyrus. Such an area has not been described in other carnivora. This area has the maximum granular character when compared to the other frontal lobe areas of the superolateral surface of the brain.

26. In the parietal lobe (lateral and the suprasylvian gyri) of the superolateral surface sensory area (main), parietal area I, II, III and III A and area parieto-temporalis pyramidalis medium granularis have been recognized, structurally.

27. On the superolateral surface the sensory area is present
immediately caudal to sensorimotor area-I in the lateral and the suprasylvian gyri. It is pyriform in shape with its apex directed upwards.

28. Parietal area-I is an extensive area which lies immediately caudal to the main sensory area, alike to which it extends in both the lateral and the suprasylvian gyri. This area also extends on to the medial surface in the caudal part of the gyrus cruciatus medialis where it is known as the parietal area-IV.

29. Parietal area-II is present only in the lateral gyrus caudal to parietal area-I. It does not extend on to the medial surface of the brain.

30. Parietal area-III consists of two quadrilateral areas, a superior (in the lateral gyrus) and an inferior (in the suprasylvian gyrus). These two areas are continuous through a part of the lateral sulcus.

31. Parietal area-IIIa lies immediately caudal to the inferior part of the parietal area-III in the suprasylvian gyrus.

32. Area parieto-temporalis pyramidalis medium granularis lies in the posterior suprasylvian gyrus and the caudal part of the middle suprasylvian gyrus.

33. The occipital lobe is represented by two areas viz. striate area-I and striate area-II. These are extensions from the medial
surface of the brain where they occupy larger areas. Striate area-II occupies the rostral horizontal part of the entolateral gyrus while in the rest of this gyrus only striate area-I is present on the superolateral surface of the brain.

34. On the medial surface striate area-II is present in the rostral half of the horizontal part of suprasplenial gyrus while striate area-I is present in the rest of the suprasplenial gyrus and whole of the posterior suprasplenial gyrus.

35. Histologically, striate area-I is equivalent to area 17 while striate area-II which is a relatively small area as compared to the former represents the characteristics of both the areas 18 and 19.

36. In the striate area-I the line of Gennari and giant stellate cells of Meynert constituting a single row in lamina IV could not be identified.

37. Solitary cells of Meynert lie scattered in lamina V of the striate area-I.

38. Only a single structurally homogenous temporal area has been recognized in the temporal lobe of the superolateral surface of the brain.

39. Area insularis or area 13 of other carnivores could not be identified in Herpestes.

40. On the medial surface of the brain, motor area, sensorimotor
area-III and the parietal area-IV are present in the gyrus cruciatus medialis. They are extensions of the corresponding areas on the superolateral surface of the brain. On the other hand striate areas are the extensions from the medial surface on to the superolateral surface.

41. Area frontalis granularis medialis is present in the rostral part of the cingulate gyrus. This granular area of the medial surface represents maximum granularization when compared to the other frontal lobe areas of the brain.

42. On the medial surface area granular anterior cingular, area granular horizontal cingular and area granular posterior cingular have been recognised in the cingulate gyrus caudal to the area frontalis granularis medialis. The characteristics of these areas are indicated by their names. Posterior cingular is more granular than the horizontal cingular.

43. No attempt has been made to identify subgroups of the various areas on the basis of minor histological differences.

44. Structures belonging to the diencephalon have been identified. Their detailed structure including the nuclei has not been studied.

45. The pineal body is a very small rounded structure of the size of a small pinhead.

46. Lateral and medial geniculate bodies are well developed.
47. The third ventricle is a small ventricle most of which is occupied by the interthalamic mass or connexus.

48. Midbrain shows the usual parts; the tectum, aqueduct, tegmentum, substantia nigra and basis pedunculi. The other fibre systems like the decussation of superior cerebellar peduncle, decussation of Forel and that of Meynert have also been recognized and described.

49. The pons is 4.00 to 4.90 x 5.00 to 7.20 mm in dimensions. In this region the corticospinal, corticobulbar, fibria pontis and its nuclei have been recognized.

50. The general plan of the gross anatomy of the cerebellum is similar to that of the other carnivores. Only two surface folia of lobule VI can be recognized as compared to three described by Larsell in the cat and the rat. Except the first lobule all the other lobules extend on to the hemispheric part of the cerebellum. The Purkinje cells are arranged in a single row with well developed baskets around them. Three pairs of nuclei (fastigium, interpositus and dentatus) have been identified in the cerebellum.

51. In the region of the medulla oblongata corpus trapezoideum and pyramids are well developed structures while the usual fibre systems like decussation of the pyramids, medial lemniscus and corpus trapezoideum have been identified and described.

52. Various nuclei including the nuclei of the cranial nerves of
the medulla, pons and midbrain have been described in alphabetical order instead of region-wise. The position and extent of the nuclei and the type and size of cells have been described.

53. Almost all the different nuclei of the brain stem as described by Huber et al., Taber, and Petrovicky in various mammals are well identified in *Herpestes* and described. However, nucleus annularis, intercalatus, intertrigeminalis, intracuneiformis, nervi oculomotorius caudalis centralis, Ferlia, parabrachialis pigmentosus, paramedian reticularis subnucleus accessorius, parvo-cellularis compactus, retroambigualis, retrofacialis, subventricularis, supravestibularis, tegmentalis ventralis of Tsai, nucleus Z of Brodal and nuclei insulae cuneati lateralis could not be located in *Herpestes*.