CHAPTER III

GENERAL STRUCTURE OF THE NUMEROUS INDIAN TRIBES IN AMERICA
The neuroendocrine complex in Heteroptera, like all other insects is formed by the association of the neurosecretory cells, their axonal pathways, the neurohaemal organs and the associated endocrine glands.

The components of the neuroendocrine complex are arranged in a bilaterally symmetrical manner in all the insects studied. However, in exceptional cases, individuals with asymmetrical neurosecretory systems are also seen. This is because of uneven distribution of the neurosecretory cells in the pars inter-cerebralis region. In all these heteropteran bugs, none show any type of sexual dimorphism as far as the neurosecretory system is concerned, i.e., the arrangement of the various components of the neuro-endocrine system is similar in both the sexes.

The morphological relationship of the neuro-glandular elements is shown in the figs. 1, 2 and 3.
PLATE I

Fig. 1: Diagrammatic dorsal view of the retrocerebral endocrine complex of Gymnocerstan species, (other than Reduvids).

Fig. 2: Diagrammatic dorsal view of the retrocerebral endocrine complex of Reduvids.

Fig. 3: Diagrammatic dorsal view of the retrocerebral endocrine complex of Cryptocerstan species.
The neurosecretory cells are distributed throughout the central nervous system which consists of the brain, the sub-oesophageal ganglion, the fused pro and meso thoracic ganglia and/or the fused thoraco-abdominal ganglionic mass.

The most conspicuous groups of the neurosecretory cells are located in the pars-intercerebralis of the protocerebrum of the brain. There are two groups of cells - (a) the median group of neurosecretory cells - arranged in two groups, one in each of the pars-intercerebralis medialis lobe, and (b) the lateral group of neurosecretory cells - located one on each pars-intercerebralis lateralis lobe. A few scattered cells are also seen in the tritocerebral region of the brain. The neurosecretory cells are not seen at any other place in the brain.

The ganglia of the ventral nerve cord also have a few neurosecretory cells in them. The distribution of these cells is not uniform in the ganglia of different species studied. As revealed in the present study there is not any neurosecretory cell in the frontal and hypocerebral ganglion in the insects of this group.

All these neurosecretory cells give off an axon each. The axons of the median cells converge to form the median neurosecretory pathways (MNP). These axons after travelling a very short distance cross over to each other so that the axons of the left group come to travel on the right side and those of the right group come on the left side. The axons after travelling the proto and the deutocerebrum come out of
the brain from the tritocerebrum as nervi corporis cardiacl I (NCC I).

The axons of the cells of pars-intercerebralis lateralis regions converge to form the lateral neurosecretory pathways (LNP). These axons come out of the brain from the tritocerebrum, at a point, a little outer to that of the emergence of NCC I, in the form of nervi corporis cardiacl II.

The axonal routes of the tritocerebral neurosecretory cells is not clearly traceable. Most probably they unite with the axons of lateral neurosecretory pathways and come out of the brain with NCC II. This is seen very clearly in *Rhodnius prolixus*.

The axonal path of the cells of the ventral ganglia is also not traceable. In all the cells except the A1-cells of the sub-oesophageal ganglion, the axons are seen directed towards the neuropile, but they are not traceable after a very short distance. The axons of A1-cells of the sub-oesophageal ganglion are seen travelling towards the anterior side of the ganglion. These axons are seen to enter the aorta wall from its ventral surface.

These nerves, (NCC I and NCC II) carry the neurosecretory material produced by the neurosecretory cells, to the neurohaemal organs. In all the insects studied except Reduvids, the aorta serves as the principal neuro-haemal organ for the median cell neurosecretory material. In Reduvids the major amount of the
neurosecretory material is seen stored in the cardioglial tissue, which is formed as a result of the fusion of the parts of the corpora cardiaca and the aorta. The NCC I in these insects penetrate the CC from their inner lateral margins to reach this area (Cardioglial tissue). Some of these axons from the cardioglial tissue are also extended in the aorta wall and are seen to be loaded with considerable amounts of the neurosecretory material.

The lateral neurosecretory cell material is carried to the corpora cardiaca by the NCC II, which serves as neurohaemal organ for this material. The NSM elaborated by the tritocerebral cells is also stored in the corpora cardiaca.

The neurohaemal organ for the NSM produced by the NSC of the ventral ganglia could not be established except for the A1 cells of the sub-oesophageal ganglion. These cells send their axons directly into aorta which serves as storage and release organ for these cells material.

The corpora cardiaca are paired glands. They are club shaped structures situated posterior to the brain, dorso-lateral to the gut and ventro-lateral to the aorta. In Gymnoceratans, the bodies of the corpora cardiaca are fused at the posterio-ventral end but they are free in Cryptoceratans. The glands are connected with the hypocerebral ganglion by means of two very minute nerves, one on each side. But in Gymnoceratans no such nervous connection was traceable because, both these
structures - the corpora cardiaca and the hypocerebral ganglion are very closely associated with each other.

The corpora cardiaca are followed by another rounded glandular structure - the corpora allata. They are paired in Cryptoceratans but in Gymnocreratans there is only one corpus allatum. In Cryptoceratan species the corpus cardiacum of each side gives off a nerve, the nervi corporis allali (NCA), which forms the bridge in between the corpus cardiacum and the corpus allatum. The NCA is formed by the association of the NCC II axons which come into the NCA via corpora cardiaca, and the NCC I axons which enters this structure at its midlength. In Gymnocreratans, the single corpus allatum is so closely applied to the corpora cardiaca, that no structure like nervi corporis allati could be differentiated. The axons of NCC I and II are seen in the fused part of the corpora cardiaca which is in association with the corpus allatum.

It can be concluded that in all the Heteropteran bugs except Reduvids, there are two independent storage and release systems for the cerebral neurosecretory cells - (a) is formed by the median neurosecretory cells, their axonal pathways, the NCC I and the aorta which is the neurohaemal organ for the NSM of these cells, and (b) is formed by the lateral neurosecretory cells, their axons, the NCC II and the corpora cardiaca, which is the neurohaemal organ for the material of these cells. In Reduvids however, the cardioglial tissue and the aorta serves as the neurohaemal organ for median cell NSM.