Seahorses are members of the family Syngnathidae. All seahorses belong to the single genus *Hippocampus*. From the Greek words, *Hippos* means horse and *campus* means seamonster. Seahorses are found worldwide in shallow coastal areas, in tropical as well as temperate conditions.

Seahorses command high market price all over the world due to their medicinal properties. Majority of the seahorses are used in the traditional Chinese medicine (TCM) and their derivatives. These medicinal preparations are prescribed for treating respiratory disorders, sexual dysfunctions and general lethargy and pain. Due to the consistent demand of seahorses and the declining natural resources, attempts are being made in several parts of the world to culture the seahorse in captivity. However, the farming of seahorses has inherent technical difficulties due to nutrition, stress and disease causing agents. Hence, the present thesis work was initiated with the following objectives:

1. To monitor the different physical, chemical and biological conditions of the different rearing systems and their possible correlation with prevalence of diseases in seahorses.
2. To isolate and characterise the major bacterial and other pathogens responsible for large scale mortality in the captive rearing conditions.
3. To study and record the different physiological and histological interactions in response to the invasion by the disease causing organisms.
4. To devise suitable remedial measures by incorporating synthetic and natural antimicrobial compounds.

The hydrological condition in the seahorse culture systems was studied using standard methods. During the experimental rearing period, the rearing water temperature fluctuated between 27°C and 30°C in the systems. In all the culture systems, the pH ranged from 7.49 to 8.03 throughout the culture period; the higher pH of 8.03 recorded in the III system. The salinity ranged between 33.4 and 36.6 ppt and the Dissolved Oxygen
content ranged from 6.46 to a maximum of 12.08 mg/l. Similarly the CO\textsubscript{2} content in the System I, II, III and IV was 7.4 to 17.6 mg/l; 5.28 to 16 mg/l; 5.28 to 13.2 mg/l and 4.42 to 8.8 mg/l respectively. Interestingly, in the system I (with seaweed and biological filter) there was no ammonia accumulation whereas in the systems II, III and IV the ammonia content ranged from 0 to 1.95 mg/l; 0 to 2.34 mg/l and 0 to 0.095 mg/l respectively. The nitrite and nitrate levels were also studied using standard methods and their fluctuations were recorded.

The results of the background microbial load indicated that in the system I, the microbial load was ranging from 2.5x10\textsuperscript{3} to 9.9x10\textsuperscript{3} CFU/ml. In the system II, the microbial load ranged from 1.2x10\textsuperscript{3} to 9.1x10\textsuperscript{3} CFU/ml. In the system III, microbial load ranged from 1.16x10\textsuperscript{3} to 9.1x10\textsuperscript{3} CFU/ml, while in the system IV, the microbial load varied between 1x10\textsuperscript{3} and 9.1x10\textsuperscript{3} CFU/ml.

Growth and mortality of seahorses were monitored at periodical intervals. In the third system, till 60\textsuperscript{th} day, no mortality was recorded. On the 30\textsuperscript{th} day the increase in average length and weight was 3 ± 0.9 mm and 0.95 g respectively. On the 60\textsuperscript{th} day, the average length and weight gain was 2 mm and 0.02 g respectively. In the IV system the growth was very slow. Besides, in the I system, though length had increased on the 30\textsuperscript{th} day and 60\textsuperscript{th} day, the weight decreased because of invasion by the pathogenic fungi, \textit{Penicillium citrinum}. In the II system also, the seahorse growth was slow.

Results of disease and mortality during the rearing period thus indicated that there were no disease outbreaks in system III in which small bits of seaweeds were planted. The seahorses were active and healthy and 100% survival was recorded. In the second system, 84.0% survived up to 30\textsuperscript{th} day while the rest succumbed to fungal infection. In the first system, 60% survived up to the 30\textsuperscript{th} day. Mortality was also observed due to bacterial aetiology. In the fourth system, 97.0% survived on the 30\textsuperscript{th} day and the remaining 3.0% died due to parasitic infections. However on 51\textsuperscript{st} day, the rest (97.0%) succumbed to fungal infection.
The external symptoms of fungal infected specimens indicated white spots and the fish were lethargic. They were anorexic and appearance of white cotton thread like structures on the white spotted area were noted. The ventilatory activity of infected seahorse became high compared to the normal ones. In the case of bacterial infection the normal body colour of seahorses changed into pale colour indicating anemic condition of the fish.

In addition to bacterial and fungal infections protozoa (with bell shaped structures) were also infecting the seahorses. The affected fish showed a tendency to remain at the bottom and there was less movement. The ciliated protozoa was identified as *Zoothamnium* sp.

In the second chapter of the thesis, the physiological status of seahorse in relation to their normal and diseased condition was studied. In addition, the major histological changes in response to the pathogenic invasion was also documented.

The results of oxygen consumption studies indicated that an apparently normal seahorse with an average weight of 0.85g consumed 249.88 mg/kg/h of oxygen. The Ammonia excretion was 2.65 mg/kg/h with an Ammonia Quotient (A.Q.) of 0.01. However, the $O_2$ consumption, ammonia excretion and A.Q decreased in slightly larger size seahorse. For example, among the 1.26 g seahorse the $O_2$ consumption, ammonia excretion and A.Q value were 210.71 mg/kg/h; 2.22 mg/kg/h and 0.01 respectively. Likewise, in 1.6 g size seahorses, the $O_2$ consumption was 66.38 mg/kg/h and ammonia excretion was 1.69 mg/kg/h which were much reduced than the others.

The $O_2$ consumption and ammonia excretion of the infected seahorse (size 0.9 to 1.95 g) indicated that they consumed 236.11 to 245.13 mg/kg/h of $O_2$ and excreted 3.33 to 3.90 mg/kg/h of ammonia. It could be thus inferred that in the case of the diseased seahorses, the oxygen consumption rate was high, proportionate to the increasing weight of the seahorse. But in the normal seahorses, the $O_2$ consumption rate was comparatively low as the weight decreased. The possible reasons for this physiological response have been discussed in the thesis.
Fish developed symptoms such as tail rot, erythemia and body colour became black. These symptoms were observed from those fishes (Oreochromis mossambicus) administered with $10^5$ cells/fish. In the case of seahorse, the normal body colour changed into white patches. The fishes were anorexic, moved vertical position with violent breathing. These symptoms were observed from the $10^5$ cells/fish onwards.

Among the group of fishes injected with $10^8$ cells/fish, 100 % mortality was observed within 12 days, whereas in fishes injected with $10^7$, $10^6$ and $10^5$ cells, the mortality was 62.5 %, 37.5 %, and 12.5 % respectively in 12 days. Fishes injected with $10^4$ cells showed 100 % survival. For the seahorse, 83.3 % mortality was noted within 2 days at $10^9$ cells/fish.

The LD50 of S.11-1 isolate was derived as $2.5 \times 10^6$ cells/fish for an average 6.6 g body weight Oreochromis mossambicus and for the seahorse the LD50 value was $2.5 \times 10^4$ Cells/fish. The normal colour of pelvic fin changed to red color and red patches were seen on the body. Such symptoms were seen from the fishes in which $10^5$ cells/fish was administered.

The fishes, which received $10^8$ cells/fish, totally succumbed within 10 days. In those fishes injected with $10^7$ and $10^6$ cells/fish, the mortality was 50 % and 12.5 % respectively within 10 days. Fishes injected with $10^5$ cells did not die (100 % survival). In seahorse, 66.67 % mortality was observed in fishes, which received $10^6$ cell/fish within 10 days. Besides, 50 % mortality was observed in $10^4$ cells/fish.

The histological studies revealed that in the gills of the fungal infected seahorses, the mycelia was spread in the bronchial arch. The affected lamellae were swollen and distorted. In the intestinal wall, structural deformities were noted. Inside the kidney tissue, the spores of *Penicillium curvum* were seen.

In the case of bacterial infected seahorses, the lamellae of gills had undergone hyperplasia and hypertrophy. Some of the lamellae were fused. In addition, the lamellar cells were swollen and globose. In the intestine, lesions including necrosis, inflammatory cell infiltration were noted in all the gut layers. In the kidney tissue, lesions were seen.
Chronic granulomatous inflammation and displacement of hematopoietic tissues were also observed.

In the third chapter of the thesis, the results of the management of microbial diseases of seahorse are enumerated. The pathogenic fungi, *Penicillium citrinum* and five isolates (suspected to be pathogenic) of bacteria were used for the *invitro* antimicrobial assay. The assay was conducted as per the standard microbiological protocols. In addition to using compounds individually, the mixture of compounds at different concentrations was also attempted for the antimicrobial assay. Apart from these compounds, extracts obtained as marine secondary metabolites (MSMs) were also used and their efficacies evaluated following standard protocols to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).

The combination of Neem oil with Copper sulphate at 0.4 : 0.1 ppm level was inferred as an effective dose in controlling the growth of fungal isolate (*Penicillium citrinum*) from seahorse. This effect could be attributed to the synergistic action of both the compounds. The probable synergistic action in inhibiting the sub cellular activities of the fungus is discussed.

Among the marine secondary metabolites tested, all the isolates of bacteria and fungi were inhibited by methanolic extracts of seaweeds such as *Caulerpa scalpelliformis*, *Caulerpa peltata* and *Ulva fasciata*. It was interesting to note that though bacterial isolates were inhibited by the extracts of sponges such as: APM47, *Callyspongia* and *Sigmadocia* sp., the inhibition of fungal isolate required only, lower concentrations than the bacterial isolates. Among the bacterial isolates, the isolate 1 (S.H-1) was more sensitive compared to the other isolates. Results of the antimicrobial sensitivity tests using the disc agar diffusion method indicated that out of the 25 antibiotics tested, 9 were not effective for the seahorse bacterial isolates. However, all the isolates were sensitive to ciprofloxacin, gentamicin and erythromycin.