EVOLUTION OF MATSYA : A STUDY

A Thesis Submitted by

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For the Degree of

Vidyāvācaspati **(Ph.D.)**

In

Sanskrit

Guide

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December 2010

DECLARATION

I hear by declare that thesis entitled " Evolution of Matsya : A Study" completed and written by me has not previously formed the basis for the award of any Degree or other similar title upon me of this or any other University or examining body.

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CERTIFICATE

This is to certify that the thesis entitled "Evolution of Matsya : A Study" which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph.D.) in Sanskrit, at Shri Balmukund Lohiya Centre of Sanskrit and Indological Studies of Tilak Maharashtra University, Pune is the result of original research work completed by Smt. Pradnya Vasant Konarde under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body upon her.

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ACKNOWLEDGEMENT

It is a pleasure to thank those who make this thesis possible. I take this opportunity to most sincerely thank to Dr. Hema Dole, Lecturer in TMV, Pune, who came in my life like a lighthouse and inspired me for the research work.

I express my sincere gratitude to my guide Dr. Sripada Bhata, Hod of Sanskrit Department, TMV, Pune for his valuable guidance and kindely inspiring encouragement without which this work would not have been complete.

I express deep sense of gratitude to the library of Late. Vasantrao Naika College of Aurangabad, S.B.O.A. Public School of Aurangabad, Bhandarkar Oriental Research Institute, Pune, Sanskrit Department of University of Pune and Authorities of library and Museum of Deccan College Pune, for their kind support and permission to pursue my research work.

A very sincere thanks to Dr. Vijay Sathe, Dr. Pramoad Jogalekar, Archeology Department of Deccan College, Dr. Sriprasad Bawadekar, Dr. Manjiri Bhalerao, a great scientist Ho. Dr. P. Natarajan, Dr. Khillare, Zoology Department of Dr. B.A.M.U., Aurangabad, Gynecologist Dr. Sujata Nagapurkar, Aurangabad, for their manifold suggestions and discussions during course of my thesis work.

I feel obliged and express my sincere thanks to Mr. Amit Bacchi and Mrs. Nisha Bacchi, NIE, Aurangabad, Mrs. Anita Shidhaye, Administrator, Dnyanada English School, Aurangabad, for improving my English and presentation skills, kind guidance and constructive criticism without which this thesis would not have been possible.

I am thankful to American Cetacean Society [ACS], and Provincetown Center of Coastal Studies [PCCS], who answered my mails and sent me required information.

Sincere thanks due to my friends, Dr. Bharati Khairnar, Mrs. Jeeva Anthony, and computer master Mr. Vinay Deshpande, my nephews Rohit and Rohan, for their help and support. I sincerely thanks my family members, relatives and friends who helped, supported and stood by me in every thick and thin.

I express my sincere thanks and gratitude to all those people who made it possible to complete the research work by their assistance and encouragement given to me.

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ABBREVIATIONS

An Intr.	*An Introduction to fishes*
AV	*Atharva Veda*
Brit.	*Britannica*
Bṛh	*Bṛhadāraṇyaka Upaniṣad*
BG	*Bhagawadgītā*
BP	*Bhāgawata Purāṇa*
ChUp	*Chāndogya Upaniṣad*
ch	*chapter*
Dict.	*Dictionary*
e. g.	*for example*
Ency.	*Encyclopedia*
ex	*example*
Hist.Geo.	*Historical Geography of Ancient India*
intr.	*Introduction*
i. e.	*it explains*
JS	*Jyotiṣa śāstra*
MBh	*Mahābhārata*
Ms	*Manusmṛti*
MP	*Matsya Purāṇa*
Mi.St.	*Microsoft Students Encarta Premium 2008 DVD*
MW	*M. Monier-Williams*
NBK	*The New Book of Knowledge*

no[s]	*number[s]*
p or Pp	*page[s].*
pict	*picture[s]e*
PP	*Padma Purāṇa*
ṚV	*ṚgVeda*
SB	*Śatapatha Brāhmaṇa*
Sa.Eng.	*Sanskrit English*
VāP	*Vāyu Purāṇa*
VnP	*Vāmana Purāṇa*
ViP	*Viṣṇu Purāṇa*
vol	*volume[s]*
WBE	*The World Book of Encyclopedia*
Yā Smṛ	*Yājñwalkya Smṛti*
SV	*Sāma Veda*
Yr	*Yajur Veda*
SkP	*Skanda Puran*
AP	*Agni Puran*
GP	*Garuda Puran*
UP	*Utter Pradesh*
BS	*Brahmasūtra*
Go Br	*Gopatha Brāhmaṇa*
Tai Ar	*Taittiriya Araṇyaka*
Cul Hi	*Cultural History*

DEDICATED TO.....

MY GURUJI

HON. SHRI SURYAKANT JOSHI

AND

MY PARENTS

SHRI VASANT KONARDE

SMT. LEELA KONARDE

CHAPTER - 1

INTRODUCTION

1.1 Scope of the study

In the Indian culture *Vedas* and *Purāṇas* are considered as important sources of knowledge. As the *Vedas* are instructed from one generation to the other *known* as *Śruti* and *Purāṇas* are told as stories known as *Smṛti*. *Purāṇas* are related to the *Vedas* equally in religious activities. Stories of *Purāṇa's* are interesting helpful to spread the Indian culture and etiquettes in the society. *Purāṇa* is one of the ways to study the Indian tradition.

According to the *Vāyu Purāṇa,* the man who has studied the *Vedas, Vedāṅgas* and *Upaniṣads*, but if he has not studied the *Purāṇas,* he is not the perfect scholar.[1] In the period of *Upaniṣads*, *Purāṇa* was known as fifth *Veda*. In the ChUp, *Nāradmuni* says as fifth *Veda* to *Itihāsa and Purāṇa.* This, however, considered the combined name which indicates the relation of *Purāṇa*.[2]

In the beginning of 19th century, the *Purāṇas* were regarded as of no historical value, but the great scholars Willson and Pargiter drew the attention of scholars to the *Purāṇic* literature. This resulted in changing the attitude towards the *Purāṇas* and their studies. That's why the topic "*MATSYA"* is selected to study the unknown scientific attitudes such as creation, protection and conservation of environment.

Now-a-days, *Purāṇas* are accepted as one of the important sources of Indian history. They throw a flood of light on the various aspects of the life of the time. They have been influencing the life of the people throughout the centuries and are valuable as supplying the materials for the critical study of such diverse subjects as religion and philosophy; folklore and ethnology [the scientific comparison of different cultures]; literature and science; history and geography; politics and sociology.[3] From this statement *Purāṇas* are important for the linguistic history of the Sanskrit, Vedic interpretation and mythology too.

In this research, there will be an effort to find out characteristics in the time of *Vaivaswata Manu*. At the same time lord *Viṣṇu* incarnated himself as a *Matsya* which is known as *Matsya avatāra.* Its moto was to protect all living beings at the time of deluge. Now the question arises that why Lord *Viṣṇu* preferred *Matsya* incarnation, although there were many animals and creatures in the ocean. *Matsya avatāra* appears half man and half *Matsya,* which indicates co-incidentally the development of living beings from vertebrates to mammals.

Here, *Mastya* is seen as a cultural unit and first representative of vertebrates in the ancient period. *Matsya* i.e. Fish is also important from the point of view of the whole environment. According to *Matsya Purāṇa,* the *Matsya* is developed from its small form to the large giant fish, which shows its evolution between the *Matsya avatāra* and the giant fish and its importance in the ancient and modern life.

Over and above this, it is clear that the *Matsya* has a cultural and scientific value. To understand the importance of *Matsya* in Sanskrit literature and also in the modern science a deep study is needed.

1.2 *Etymology of Purāṇas - Purāṇottapti*

Origin of the term *Purāṇa* has been given by *Pāṇinī, Yāska,* and *Purāṇas themselves*.

पुराभवम् इति पुराणम् । [happened in the ancient time.]

Pāṇinī used the term *Purāṇa* in his two *sūtras* –

१ पुराणप्रोक्तेषु ब्राह्मणकल्पेषु । [4-3-105]

२ पूर्वकालैकसर्वजरत्पुराणनवकेवलाः समानाधिकरणेन । [2-9-49]

Yāska says – पुरा नवं भवति । [ancient appears new.]

According to the VP, *Purāṇa* means which existed in ancient times.[4] BrP gives some different definition – *Purāṇa* means it was happened in ancient times.

These definitions show that *Purāṇas* is closely related to ancient times. In ancient literature *Purāṇa is* shown closely related with *Itihāsa*, so the combination of *Itihāsa-Purāṇas* is used in the historical sense. *Purāṇas* were the imaginary stories and the real incidences were known as the *Itihāsa*. This is the main difference in the meanings of these two –*Itihāsa* and *Purāṇa.*

1.3 Pañcalakṣṇas of Purāṇas

The main object of the 18 *Purāṇas* is to describe the five ingredients, which are called as *'pañcalakṣṇas'*.

सर्गश्च प्रतिसर्गश्च वंशो मन्वन्तराणि च ।

वंश्यानुचरितं चेति पुराणं पञ्चलक्षणम् ।।[5]

These are described with the help of many interesting stories known as *ākhyāna and upākhyāna.* These *pañcalakṣaṇas* are the main five subjects of *Purāṇas,* which are discussed in detail in *Purāṇa* each and every *Purāṇa.*

Pañcalakṣaṇas are -

1. The original creation of the universe [*sarga*].
2. The periodical process of deluge and re-creation [*pratisarga*].
3. The various eras [*manvantara*].
4. The histories of the solar and lunar dynasty [*vaṁsa*].
5. The royal genologies [*vaṁsānucarita*].

BP states the ten *lakṣaṇas* for the *Mahāpurāṇas*. Instead of above *pañcalakṣaṇas*, anotherfiveare – *vṛtti, rakṣā [Iśwarāvatāra], mukti, hetu [jīva]* and *apāsraya [brahmā]*.[6]

1.4 Scope of the ancient literature

In the ancient time *Purāṇa* was used as a type of *vidyā* [*sṛṣṭi-vidyā*]. *Purāṇa* is the original source of many branches of Indian wisdom.

A] *Saṁhitās*

In the RV, *Purāṇa* was used for its ancientness only. AV explains the creation of the *Purāṇa* with RV, SV, *Chanda* and YV. These were created by the spit out of the mouth of the *Paramātman*.

ऋचः सामानि छन्दांसि पुराणं यजुषा सह । उच्छिष्टाज्जज्ञिरे सर्वे दिवि देवा दिविक्षिताः ।।[7]

B] ***Brāhmaṇas***

Many references occur in SB and GB which describes the popularity of the *Purāṇas.* Here *Itihāsa* and *Purāṇa* are described as related to the *Vedas.* GB tells the formation of *Vedapañcaka,* including *Purāṇa* also.[8] About the creation of *Vedas*, it is told as from the upper side – *Ūrdhwa* [exactly upper part of the head] and Dhruva side [downward to legs] *Purāṇas* were created while *Itihāsa* was created from North side of *paramātmā.*[9]

C] ***Āraṇyakas***

Araṇyakas and *Upaniṣads* are the last part of *Brāhmaṇas. Purāṇic* references occur in the *Brahmayajña* chapters.[10] Here *Purāṇa* shows the plurality of *Purāṇa*, that means there was not any single *Purāṇa* but many *Purāṇas* were considered in the form of legends [*ākhyānas*].

D] ***Upaniṣads***

In ChUp *Nāradmuni* says that *Purāṇas* are fifth *Veda* among the *Vedas*.[11] Brh compares the *Purāṇas* with RV, SV, YV, AV and *Itihāsa* as the exhalations of God. As the smoke scatter separately from the fire of burnt wet wood, in the same way *Purāṇas* and *Vedas* are the exhalations of God.[12]

E] ***Mahābhārata***

In MBh, *Purāṇas* are described not only in general character but in detail introduction of stories and peculiarities of *Purāṇas*. In *Anuśāsanaparva*, *Purāṇas* are considered as the commands of *Iśwara* and these are logically not opposed. MBh also states that with the help of *Purāṇas Vedas* can be learnt easily.[13]

F] *Kauṭilya*

Kauṭilya considered *Purāṇas* as *Itihāsa* in his *Arthaśāstra.* At that time *sadācāras* found in the *Purāṇas* were told as the teachings, which help to improve the behaviour of the kings.[14] *Kauṭilya* was familiar to the *Purāṇas*.

G] *Smṛti*

In the *Yā Smṛ*, *Purāṇas* are included in fourteen *vidyās* and occupy the first place in all *vidyās* along with *Dharma* [righteousness].[15] Thus the ancient literature shows how *Purāṇas* are old, how are they developed from *Vedic* period to *Gupta's* period, etc. In the Vedic period *Purāṇas* were considered in a single form as *Purāṇa* but later on 18 *Purāṇas* were known by the single word *Purāṇa* is used frequently. Albaruni, an Arabian author referred to many points from *Purāṇas* in his composition related to *Bhārata* [16] and these points now a days occur in *Purāṇas* .

1.5 *Age of Purāṇas*

In the Vedic period *Purāṇas* were in a form of group known as *Purāṇa-vidyā.* As the *Purāṇic* development proceeded, *Vedavyāsa* made this group of *Purāṇsaṁhitā*. So there are two opinions about the age of the *Purāṇas* —

1] One is before *Vyāsa* i.e. about *Purāṇa-vidyā*

2] Another is *Vyāsa's* great work, creation of *Purāṇasamhitā*

Appearance of the term *Purāṇa* is mentioned in MP which states the appearance of *Purāṇa* before the period of the *Vedas.*

पुराणं सर्वशास्त्राणां प्रथमं ब्रह्मणा स्मृतम् । नित्यं शब्दमयं पुण्यं शतकोटिप्रविस्तरम् ॥[17]

The word *śatakoṭi pravistaram* represents the indefinite forms of *Purāṇa.* In the history of *Purāṇas* the new age is started when *Vyāsa* made one *saṁhitā* of the *Purāṇa,* created by *Brahmā, Purāṇas* systematically classified like *ākhyāna, upākhyāna, gāthā and kalpaśuddhi*.[18]

There is another opinion about the appearance of *Purāṇas*. SkP [*Revāmāhātmya*] PP [*sṛṣṭi khaṇḍa*] and MP refers to this tradition. This tradition says *Purāṇa* was a single form. It was very large because it was in the form of 100 crore verses. Many *Purāṇas* agree that this *Purāṇa* literature was instructed in *Devaloka* [heaven]. Since the study was limited, common people could not get the chance to study the *Purāṇas* having realized, Lord *Viṣṇu* in the form of *Vedavyāsa* divided briefly this great literature into 4 lack verses. So on the earth *Purāṇas* are having 4 lack verses which are divided into 18 *Mahāpurāṇas* by *Vyāsa* and these are very popular to the people now-a-days.[19]

Purāṇic references are found in the *Vedic* literature and *Smṛti-literature*. There was only one opinion about the age of *Purāṇas* that *Purāṇas* are originated from the mouth of *Brahmā.* According to MP, *Brahmā* created *Purāṇas* first and afterwards *Vedas*.[20]

Purāṇic developments might have proceeded between 400-600 AD. During this time MP was created. There are different opinions of scholars about the date of MP. No one date is sufficient to express the fix date of MP. Hazra R.C. remarks that "the date of earlier form of the present *Matsya* seems to be the same as that of the *Matsya's* borrowing the chapters of the second group from or the first

quarter of the fourth century AD." [21] While Pusalkar remarks that current *Purāṇas* are compiled in some centuries before AD and after AD. [22]

According to Kane P.V. "it cannot be later than the sixth century AD" [23] Diksitar spreads up the date of MP over a number of centuries commencing probably with the third fourth century BC and ending with the third century AD[24] According to Durgashankar Shastri, the material of the MP dealing with the *Purāṇic* themes viz. sarga, pratisarga , etc. is as old as the third century AD [25] Whereas Pargiter remarks the MP account brings the historical narrative down to about the middle of the third century and no further. From this survey it is clear that there is a diversity of opinions regarding the problem of the date of MP.

From the above, it seems that *Purāṇas* originated before 500-600 BC in the form of *Purāṇasaṁhitā.* Thus it can be seen that this development proceeded into 18 *Mahāpurāṇas* and 18 *Upapurāṇas* up to 7-8th century. The composition of *Purāṇas* is to be spread over a long time covering several centuries from the epoch of *Brāhmaṇas* and the *Upaniṣads* to the age of the Guptas [4th to 6th century] and afterwards.

Diksitar commented on MP briefly in '*Purāṇa-Index'*. He pointed out the age of MP and stated that MP mentions the names of *Vyāghrapāda, Patañjali* and *Kātyāyana*, and also refers to *Arthaśāstra* and *Bābhravya Pāñchāla*. It also refers to the *Nāṭyaśātra o*f Bharata. From these references, the MP must be undoubtedly post-*Pāṇinīan*.[26a] The date of MP is probably to be spread over a number

of centuries commencing with the 4th century BC and ending with the 3rd century AD.

1.6 *Place of Matsya Purāṇa*

The source of the mythology however, is found in the *Purāṇas*. All *Purāṇas* contain information on incarnations, cosmology and creation, genealogy of kings and time. It is found in the 53rd chapter of MP, Lord *Viṣṇu*, himself in fish incarnation determined that to compile the *Purāṇas* in the extent of 4 lack verses, His partial incarnation of *Vyāsa* divided *Purāṇasaṁhitā* into 18 *Mahāpurāṇas* and made them spread in the world.[26b] Here Lord *Viṣṇu* explained each and every *Purāṇa* with its number of verses and serial order.[27] He also introduced *Upapurāṇas* in this chapter.[28] Regarding the place of composition of MP it seems, there was no unanimity had been found. South India, Nasik, Andhra and the *Narmadā* Valley are claimed as the home of MP by different scholars. Diksitar expressed the opinion that "it might have originated in South India." [29] According to MP, some parts of states of the Matsya tribe inhabited the Matsya territory, which corresponds to the modern territory of Jaipur.

Hariprasad Shastri states that on the strength of the great prominence given to the region about the river *Godāvari* in the MP, the place of composition of the MP was Nasik.[30] Hazra R.C. holds that the MP was composed and circulated by *Vaiṣṇava* people living somewhere about the river *Narmadā.* In the second chapter of MP, the river *Narmadā* and not the famous Ganges, is said to remain even

after the destruction of the world.[31] The writer of MP introduced many observations on the bank of *Narmadā* river, this was not possible for the writer living in any other region.

Thus according to these opinions, one may conclude that the composition of the MP took place somewhere about the river *Narmadā.*

1.7 *Matsya Purāṇa*

In BP 18 names of *Purāṇas* are described in the twelth *Skanda*.[32] The secondary *Purāṇas* [*Upapurāṇas*] are *Narasimha, Nāradiya,* etc. According to PP and MP, they are classified into three types *Sāttvika, Rājasa* and *Tāmasa.* PP remarks the MP as a *Tāmasa Purāṇa* but MP itself states as *sāttvika Purāṇa* because glorification of *Viṣṇu* is described in the *sāttvika Purāṇa.* According to the MP, the *Purāṇas* glorifying *Hari* are regarded as *Sāttvika,* those glorifying *Brahmā* as *Rājasa* and those glorifying Agni and *Śivā* as *Tāmasa*.[33]

At the time of deluge, Lord *Viṣṇu* in his *Matsya* incarnation recited this *Purāṇa* to *Vaiwaswata* Manu so the name is given as MP. This is the only one *Purāṇa* where Lord *Viṣṇu* himself recited the *Purāṇa*.

According to ViP, *Devi Bhāgawata* and VnP, MP is the first *Purāṇa* amongst 18 *Purāṇas*-

मुख्यं पुराणेषु यथैव मात्स्यं । स्वायम्भवोक्तिस्त्वथ संहितासु ।। [34]

While explaining the different body parts of *Purāṇapuruṣa* - Lord *Viṣṇu*, PP describes MP as *Meda,* **मात्स्यं मेदः प्रकीर्त्यते.**[35] MP includes 14000 verses and 291 chapters. Amongst the 18

Purāṇas, MP is 16th in the serial order. MP fulfils the *pañcalakṣaṇas.* The MP has borrowed the dynastic account of the kali age from the *Bhaviṣya,* probably during the last quarter of the century. From the contents of the MP, it would be clear that there are not only topics that only dealt within the MP, but there are certain topics shown in the index; they are: *Utapatti, pralaya, vaṁśa, manvantara, vaṁśānucarit, bhuvana-vistara, dānadharmavidhi, varṇāśramavibhāga, iṣṭāpūrti, devatpratiṣṭhā* etc.[36] MP has chapters on *śraddhā* various *vratas, dānas, mahādānas, rājadharmas, vāstu,* various stories and legends. According to Kane P.V., MP is a pre-eminent work containing *Dharmaśāstra* material.[37] Kantawala observed, the verses of the MP regarding social, political, religious and philosophical data etc, are either identical or approximate to those of the MBh, BG, MS, AP, *Harivaṁśa,* etc.[38]

Willson H. H. determines that MP mainly deals with the history of the creations of the Universe created by *Brahmā*, the creator, the dissolution of the Universe made by *Śivā,* the destroyer and the preservation of the Universe from total dissolution by *Viṣṇu* - the saviour. *Brahmā*, *Viṣṇu* and *Śivā* are the different mainfestations of the one and the same Supreme Being.[39]

From all this it would be clear that the MP occupies an important place in the *Purāṇic* literature as well as it plays an important role in the study of ancient culture from several points of view. By observing the contents of MP this '*Matsya'* topic is selected for the research to study the *sṛṣṭi-vidyā,* origin of the Universe and the development of animal kingdom.

1.7.1 *Avatāravāda*

Purāṇas are related to the *avatāras* of the Lord *Viṣṇu*. To punish the demons and to save the universe time to time Lord *Viṣṇu* incarnated Himself in the various *avatāras*. There are many more such *Aṁśa avatāras* (partial incarnations) and these forms assumed by the Lord for granting boons to devotees, for saving the world from ruin, for laying down the Code of Morality and Right Behaviour for humanity, and the restoration of traditional and well-established ideals and morals among mankind.[40]

Etymology of the term *avatāra* shows 'ava' prefix joined with √T*ṛ*. About this *avatāra*, *Pāṇinī* explained it as the procedure from the highest position to come down.[41] *Avatāra* means to come down of any Lord or Goddess having super powers and they incarnate themselves in the form of human or any other form to protect their devotees and world from the wicked people. This concept is well explained in the famous verse of BG [यदा यदा हि धर्मस्य].[42] According to MP, it is considered as Lord incarnates in the human form or any other form.

त्यक्त्वा दिव्यां तनुं विष्णुर्मानुषेस्विह जायते ।युगे त्वथ परावृत्ते काले प्रशिथिले प्रभुः।।[43]

Purāṇas consist of *sarga* and *pratisarga* i.e. *sṛṣṭi-vidyā,* to protect the Universe and *Dharma.* Lord *Viṣṇu* incarnated Himself in ten incarnations [*avatāras*], which indicates the gradual development of the animal kingdom, according to the geological development of animals. In SB, it is stated that *Prajāpati* incarnated himself in *Matsya, Kūrma* and *Varāha avatāras*.[44] MBh also mentions

the references of *Matsya* incarnation of *Viṣṇu*.[45] This concept of *Matsya avatāra i*s a *Vedic* concept.

In the BP the story of *Matsya* incarnation is described in brief only in one chapter. AP, GP, and PP also explain the *Matsya* incarnation of Lord *Viṣṇu*.[46] In the BP the study is further elaborated by the addition of a fight between *Matsya* and the demon, [vide fig. 1] who had stolen the *Vedas* when *Brahmā* was asleep.[47] While *Brahmā* was falling asleep, at the end of the KALPA, the Vedas were stolen by the *Asura* and mainly to catch the from the deep ocean, Lord *Viṣṇu* incarnated himself in a big fish, caught the demon acts and retrieved the *Vedas.*[48] That means whenever the Universe is in danger Lord *Viṣṇu* protects the Universe by incarnating Himself in the different incarnations and save the mankind from the wicked demons.

1.7.2 *Matsya avatāra*

*Matsya avatāra i*s the first incarnation of the Lord *Viṣṇu*. In His fish incarnation, *Viṣṇu* has the lower part of His body like a fish (*Matsya*) and upper part like a human i.e. half man-half *Matsya*. He has four arms; with two he holds a conch shell and a wheel, while the other two are holding a lotus and a mace are in the protection and boon giving modes [vide fig. 2]. If it is said that the Lord *Matsya* was the installer and protector of Universal culture, then it will not be a wrong concept.[49]

Why Lord Viṣṇu selected Matsya avatāra ?

First reason for selecting the *Matsya avatāra* is to kill the demon[50] from the deep ocean and to protect the Vedas for the new

creation. As he had stolen the *Vedas*, FISH was the suitable [living form] animal species which can swim so fast and survive more time in the ocean. So Lord *Viṣṇu* incarnated himself into a big fish and fought with him.

Second reason is related with the geological development of the earth. Fish is the first vertebrate animal on the earth or the development of animal kingdom is started in water with very small living beings in which fishes are very important. So the fish is the symbol of aquatic ecosystem. Fish lives only in water and dies outside the water.

According to Agrawal V.S., fish is the appropriate symbol of the principle of the egg. The cosmos is the Egg of *Brahmā (Brahmāṇḍa*). Here *Brahmā,* himself is the fish and therefore the *Brahmāṇḍa* is the same as *Matsyaṇḍa.*[51]

The class Pisces is the largest of all vertebral classes including somewhat 22,000 species. Fishes can live under a great variety of conditions, at the surface of the sea, in mid-water at the bottom. Agrawal V.S. compares the resemblance between developing child in the womb called the fetus and the fish in the water. The fish is the most dominant symbol of an oviparous [*aṇḍaja*] vertebrate producing the life-germ. Although human beings have developed a placental stage [*jarāyuja*] still both belong to a common ancestry extending over geological times.[52]

This discussion explains the motive of lord *Viṣṇu* to take the *Matsya avatāra* in the form of half man and half *Matsya.* From this it is clear that the incarnations are the *Purāṇa* Literature through

the interesting stories of *Purāṇas*. No doubt *Purāṇas* are helpful to spread the Indian culture and etiquettes, as well as the hidden scientific values which are very essential now-a-days to protect the environment.

1.7.3 Conversation of Manu Matsya

The main conversation of *Manu-Matsya* occurs in the first, second and third chapters of MP where the Lord *Viṣṇu* shows the Manu his giant form of fish.[53] The story of MP had told by *Lomaharṣaṇa* to many sages who gathered in *Naimiśāraṇya.*

The story goes that a certain king named Manu, son of the Sun-God leaving his kingdom went out to Mount Malaya to perform penance [*tapasyā*] and there obtained a boon from *Brahmā* that he should be able to protect all the creatures at the time of dissolution. The boon was granted and then one day at the time of offering oblation to *pitṛs*, the king noticed a small fish [*śapharī*] in the palm of his hand.[54] [vide fig. 3]

अहोरात्रेण एकेन षोडशांगुलविस्तृतः । सोऽभवन्मत्स्यरूपेण पाहि पाहीति चाब्रवीत् ॥२०॥

स तमादाय मणिके प्राक्षिपज्जलचारिनम् । तत्रापि चैकरात्रेण हस्तत्रयमवर्धत ॥२१॥

पुनः प्राहार्तनादेन सहस्रकिरणात्मजम् । समत्स्यः पाहि पाहीति त्वामहं शरणंगतः ॥२२॥

ततः स कूपे तं मत्स्यं प्राहिणोद्रविनन्दनः । यदा न माति तत्रापि कूपे मत्स्यः सरोवरे ॥२३॥

क्षिप्तोऽमौ पृथुतामसौगात्पुनर्योजनसम्मितम् । तत्राप्याह पुनर्दीनः पाहि पाहि नृपोत्तम ॥२४॥

ततः स मनुना क्षिप्तोगंगायामप्यवर्धत । यदा तदा समुद्रे तं प्राक्षिपन्मेदिनीपति ः ॥२५॥

यदा समुद्रमखिलं व्याप्यासौ समुपस्थितः । तदा प्राह मनुर्भीतः कोऽपि त्वमसुरेतरः ॥२६॥ [55]

"He put it in the *kamaṇḍalu* in which that the small fish started to grow within a day; it was sixteen fingers in length. Then the

king Manu threw it in a jar and the same happened again. Then the fish was thrown in the well but the well soon became too small for the fish. Then Manu transferred the fish into a pond, after which into a river and finally the fish was consigned to ocean. When the fish form filled the whole ocean by its giant size the king was surprised and asked him." [56]

" अथवा वासुदेवस्त्वमन्य ईदृक्कथं भवेत् । योजनायुतविंशत्या कस्य तुल्यं भवेद् वपुः" ॥२७॥

"Are you the chief of Asuras? Or are you *Vāsudeva*; who else as such extraordinary power to assume such a tremendously big form extending to sixteen hundred miles. I have known the truth; you are certainly Lord *Viṣṇu*, the cosmic deity in the form of the Fish."

एवमुक्तःसभगवान्मत्स्यरूपी जनार्दनः । साधुसाध्विति चोवाच सम्यग्ज्ञातस्त्वयाऽनघ ॥२९॥

अचिरेणैव कालेन मेदिनी मेदिनीपते ! । भविष्यति जले मग्ना सशैलवनकानना ॥३०॥

नौरियं सर्वदेवानां निकायेन विनिर्मिता। महाजीवनिकायस्य रक्षणार्थं महीपते! ॥३१॥

स्वेदाण्डजोद्भिदो ये वै ये च जीवाजरायुजाः।अस्यां निधाय सर्वास्ताननाथान् पाहि सुव्रत!॥३२॥

युगान्तवाताभिहता यदा भवति नौर्नृप ! । शृंगेऽस्मिन्मम राजेन्द्र ! तदेमां संयमिष्यसि ॥३३॥

ततो लयान्ते सर्वस्य स्थावरस्य चरस्य च । प्रजापतिस्त्वं भविता जगतः पृथिवीपते ! ॥३४॥[57]

The fish replied, "O king, you have known the truth. Soon the earth will be submerged under water. The *Devas* have made this boat for the protection of living beings; place them on the ship and when you will find the boat in danger of being blown away by the strong gusts of wind, tie it to my horn. When the storm will over, you will have saved the creatures and then be crowned as *Prajāpati* of the world." [58]

After hearing such words of the Lord *Viṣṇu* the king Manu begged to reveal to him in how many years the destruction time is likely to come. The Fish replied that for hundred of years there would be a severe famine and the sun would emit such intense heat as would reduce every thing on earth to ashes.[59] *Śeṣa* from his abode would send forth venomous flames from his thousands mouths[60] and a furious fire would emerge from the third eye of *Śiva*.[61] so that the three worlds the sky, the gods and the stars would all be consumed. Then seven destructive clouds [62] would appear at the end of time. They would spring up from the vapours arising out of such a heat and would rain in torrents till all the seas become united into one great mass, named as *Ekārṇava.* [63]

एतदेकार्णवं सर्वं करिष्यति जगत्त्रयम् ।[64]

Then the king Manu was also told that the boat which would come to him, he should stock the seeds of living beings and the sacred *Vedas* in it. After that he should fasten the boat to its horn by means of the rope. Then the contents of the boat will be saved by the glory of the Divine Creator.[65] Things happened as was predicted and all the assurances given were fulfilled. The rope was cosmic serpent and the Fish to whose horn the boat was tied in the midst of the watery flood, which was the Divine Creator himself.

After that Fish told Manu that everything will be destroyed, only Manu, the moon, the sun, [Lord *Viṣṇu*] Himself, *Brahmā* , the sacred river *Narmadā,* the great sage *Mārkaṇḍeya*, the sacred *Vedas*, the *Purāṇas,* the God *Śivā*, various sciences will be

saved and the king *Cakṣusa Manu* should terminate with the coming partial dissolution.[66]

Later on at the beginning of the re-creation of the Universe the Fish will propagate the Vedic knowledge to the king *Manu* and so saying that the Fish vanished away suddenly.

1.8 *Daśavatāras of Viṣṇu*

Lord *Viṣṇu* manifested himself in various incarnations, called *avatāras*, for the destruction of evil or Restoration of faith and justice in the world. These incarnations are said to have been in the human form, in the animal form and even in the combined human-animal form [vide fig. 4]. The ten incarnation of *Viṣṇu* i.e. *Daśavatāras of Viṣṇu* are very popular and these are the important topics for the *Purāṇas*[67].

It is believed that out of ten incarnations nine have already been manifested while the tenth is yet to appear. These ten incarnations are related to the evolutionary development of animal kingdom i.e. vertebrates to fully developed humans. The Lord *Viṣṇu* also incarnated himself in the same manner [*Daśavatāras*]. It is interesting to note the evolution of these incarnations from lower to higher forms of life and their reflection on the history of the evolution of mankind. Here, the ten incarnations are explained with the reference of evolutionary development of animal kingdom.[68]

Matsya, the fish incarnation symbolizes the forming of protoplasm and vertebrates.

Kūrma, the tortoise symbolizes the amphibian form.

Varāha, the boar symbolizes the existence of mammals.

Narasiṁha, the half-man, half-animal incarnation shows the development of hands and fingers on animals and the evolution of the sub-human or ape form.

Vāmana, the dwarf reflects the incomplete development of man.

Paraśurāma, the Rama-with-the-axe incarnation symbolizes the Stone Age. The axe symbolizes the start of the use of metal by mankind.

Rāma shows the ability of mankind to live in cities and to have an administration.

Kṛṣṇa (one who knows the sixty-four arts); reflects the development of the sciences.

The Buddha incarnation reflects the intellectual and scientific development of man.

Kalki the tenth and yet to come incarnation. In the years to come there will be a moral degradation in society and this future incarnation will save mankind.

The first incarnation of *Viṣṇu* took place as a fish – the *Matsya avatāra.* The glory of *Nārāyaṇa* was described as *Nārāyaṇa Yakṣakīrtanam* in the ten verses and this glory had been explained in *Vedas* and the *Ādi-Purāṇas*.[69] Here Lord *Viṣṇu* himself described the *Nārāyaṇa* as he is active energy of all Devas, secret knowledge of *Maharṣiṣ.* He is the deity of all *yajñas*, object of mediation *Adhyātma* thinkers. He is the Supreme *Deva* spoken of in many ways [उच्यते विविधैर्देवः स एवायं न तत्परम्][70] there is nothing higher than Him. He is the *Bhagavāna* who creates and destroys everything. It is He, who makes all creatures in action. All the legends and the *Vedas* aim at His description. He is the cosmos and the Lord of cosmos.[71]

Vinod M. K. has mentioned the scientific view of *Daśavatāras* in his article '*Darwinian Daśavatāras*.' He states that the *Daśavatāras* seem to have given us the Theory of Evolution, even though in a different package, long before Darwin's time. Yet we would rather peruse through foreigners' theses than even cast a glance at our own texts. Agreed that Darwin's work is a far more scientific version, better suited for scholastic purposes, but the *Daśavatāras* too, if understood properly, is a meaningful study of evolution. It is accepted that all of the earth was inundated by water before life forms took shape. Thus, the *Daśavatāras* believe that the first life form was aquatic - the *Matsya avatāra* in the form of a fish. In the classical theory too, Pisces was one of the first life forms to evolve. Next, these creatures began to crawl onto the landmasses and began dwelling in both habitats. This was the birth of the amphibian. In the *Daśavatāras*, the *Kūrma avatāra* followed, which was a turtle that lived both on

land and in water. The *Varāha avatāra*, in the form of a wild boar, portrays the birth of the mammal. [72]

1.9 A compiler - *Vedavyāsa*

A well known person, great author, is known as *Vedavyāsa*, since he divided the *Vedas*. He is also called as *Kṛṣṇa Dwaipāyana* referring to his black colour and birthplace.

He allowed people to understand the divine knowledge of the *Veda.* He was the last *Vyāsa* amongst 28 *Vyāsas,* who incarnate in every *Dwāpara Yuga* to split the *Vedas*.

About the splitting of *Vedas,* ViP mentions that at the starting of *Dwāpara* [73] *Yuga* spirit and power decreases, considering this for the welfare of all mankind *Vyāsa* [incarnations of the *Viṣṇu*] splits the *Vedas.*[74] In the every *Dwāpara Yuga, Vyāsa* in the form of *Viṣṇu* splits the *Vedas,* compiles 18 *Purāṇas* from the *Purāṇa-saṁhitā*.

व्यासरूपमहं कृत्वा संहरामि युगे युगे । चतुर्लक्षप्रमाणेन द्वापरे द्वापरे सदा ।।[75]

Our Indian culture is based on the MBh and *Purāṇas* written by *Vyāsa*. Compilation of *Itihāsa- Purāṇas*, reconstruction of arts and edition and division of *Veda- Vedāṅgas*, are possible because of these great works of *Vedvyāsa.*

Time

According to MBh, he was the son of *Satyavati,* a fishermen's daughter [*Matsyagaṇdhā*] and the wandering sage *Parāśara.*[76] He was born on an island in the river *Yamunā*. This is said to be near *Kalpi* in Jalaun district in UP.[77] He was grew up to be an

adult as soon as he was born, adopting the life of an ascetic, he soon became one of the greatest *ṛiṣis*. According to historians, the time of birth of *Vyāsa* is considered as 3100 BC[78] on the basis of Indian battle and in the joint period of *Dwāpara* and *Kali Yuga. Śukamuni,* narrator of BP, was the son of *Vyāsa. Vedvyāsa* was the grandfather of *Kauravas* and *Pāṇḍavas* as he was closely related to their race.

Vyāsacaryā - Creations of *Vyāsa* are called *Vyāsacaryā.*

1] *Purāṇasaṁhitā*

In the Vedic time *Purāṇas* were scattered in different forms as *Gāthā, Nārāśaṅsī. Vyāsa* arranged these *Purāṇas* and compiled a systematic form of his own *Purāṇas* known as *Purāṇasaṁhitā* and taught this *Purāṇasaṁhitā* to his disciple *Lomharṣaṇa* and told him to spread it to his disciples.

2] *Mahābhārata*

MBh, a great epic of *Bhārata* Dynasty is a text of some 100,000 verses attributed to the sage *Vyāsa*, was preserved both orally and MSS from many centuries.[79] The central theme concerns with great battle between the *Pāṇḍavas* and *Kauravas*. The 18 days battle leads to the destruction of the entire race, but saved one survivor who continued the dynasty.

C] *Brahmasūtra*

Bs attributed to *Bādarāyaṇa* which makes him the jewel of Hindu philosophy i.e. *Vedānta.* As the island on which *Vyāsa* was born is said to have been covered by Badara [Indian jujube] trees, he is known as *Bādarāyaṇa*, who compiled the *sūtras*.[80] Many historians think these were two different personalities.

4] *Yoga Bhāsya*

Yoga Bhāsya is a commentary on the *Yoga Sūtra* of *Patañjali. Vyāsa* is credited with this work also, though this is impossible, if *Vyāsa's* immortality is not considered, as it is a later text.

Ideal Man

Ketkar S. says, the *Vyāsa* is the only person in the world who thought the concept of globalization through the literature and worked out successfully from last centuries.[81]

Indian scholars respect *Vyāsa* as an ideal or historical person while Western scholars are doubtful about the existence of *Vyāsa*. Many references about *Vyāsa* are found in *Vedic* literature.[82] *Pāṇinī* also considered him as the son of *Parāśara*.[83] *Śaṅkarācārya* told their *guruparaṁparā was started* from *Vyāsa*, whereas *Vyāsa,* in Buddhist literature *kṛṣṇa Dwaipāyana* name is considered as *Kanha-Dwaipāyana* and the form of Buddha.

From the ancient period, the difference between scholars and ordinary people is neglected due to the moral stories and legends of *Purāṇas*. MBh and *Rāmayaṇa* which spread in the each and every village of India and great knowledge of *Vyāsa* spread up to the ordinary people and became immortal forever.

1.10 Survey of the research

Book reviews and articles –

Here, some book reviews of scholars and some articles found on internet [who studied MP] are given.

1] '*Matsya Purāṇa* : *A Study'* by Agrawal V.S.

A great scholar of MP criticized overall contents of MP. The author is only one expert of *Purāṇic* studies who discussed all chapters [291] of MP according to so many aspects such as scientific, geographical, political, mythological, traditional and chronological views and so on. There is discussion about the glorification of *Viṣṇu,* concept of *Ekārṇava jagat, Hiraṇyagarbha*, king dynasties, etc. He stated that MP is like a mirror to the kaleidoscopic religious and spiritual movements that had flooded the country during the first five or six centuries of *Vikrama* Era.

In the present study he has endeavored to bring home the truth of many legends in the light of Vedic symbolism. He explained the terminology of the *Purāṇas* and of the *Vedas* as part of an integrated system of thought. He tried to show how *Purāṇic* thinkers have advanced the nucleus of the Vedic thought and cast it into the new moulds of legends and descriptions. He gives importance to show the symbol of creation in fish tadpole stage and mother's womb developments.

Although he has studied all the chapters of MP, but he did not travelled up to the evolution of *Matsya* with that of modern relevance of whale. There is no discussion about *Matsya avatāra* as compared to *Whale avatāra*. Even though, this work is mostly appreciable. This research is valuable and helpful guideline for a student of *Purāṇa* literature.

2] '*Cultural History of Matsya Purāṇa*' by Kantawala S.G.

Kantawala took efforts for an intensive work and critical study of the data embedded in MP. According to him, the studies of individual *Purāṇas* from a cultural point of view are yet desired. MP has not received that attention which it really deserves from a cultural point of view.

3] '*Matsya Purāṇa, A Study* ' by Diksitar V.R.R.

Diksitar is another expert of *Purāṇa* literature. He commented on some important points of MP, such as flood legends described in Vedic literature and in other ancient countries. He pointed out the probable date of flood and the place of flood. He also stated the coincidences between Babylonian and Indian legends. Some other issues described in the book are origin of MP, theory of incarnation, the fish and the record of the rocks, traditional origin of the earth and vegetation and the cult of fish.

He explained evolution of animal kingdom as *aṇḍaja* and *jarāyuja*. One more interesting findings he has done, that is the image of fish, which is worshipped as *Viṣṇu,* even today in the *Paraśurāma* temple of Tiruvallam. The author stated the different opinions about the ancient tribes – *Matsyas*. He concluded that each incarnation represents a distinct stage in the story of evolution of life. Hindu theory of incarnation is deep rooted among Hindus that these ten incarnations are the different manifestations [visible forms of divine being] of the Lord *Viṣṇu*.

4] '*Purāṇa-Index*' by Diksitar V.R.R.

Here, author described in brief fie important *Purāṇas* including MP. Ha has selected five only because they are most ancient

compositions among the eighteen *Purāṇas*. He preferred to explain the date of MP, its historical value and he placed MP among the oldest *Purāṇa*.

5] '*The Purāṇas In The Light of Modern Science*' by Ayar K. Narayanaswami

Author studied the *Purāṇas* on the basis of *pañcamahābhūtas*. He tried to show the *sarga* and *prati-sarga* in reference to the modern science. He explained the formation of five elements [*pañcamahābhūtas*] mathematically from the standpoint of plane geometrical forms. Evolution, minerals, the *jaṅgama* or locomotive kingdom and animal kingdom, these issues are discussed in reference to the science. There is description of superman regarding the two stages of creations i.e. *Kaumāra* and *Aṇugraha* creations.

Later on, he focused on *Kāla* [time], *avatāras*, the number of *avatāras,* their underlying significance and key to the meanings. The author explained the fish incarnation according to version found in *Purāṇas* and Vedic literature. But he has not pointed out the fish incarnation according to evolution theory.

6] 'Flood Legends In Sanskrit Literature' by Suryakanta

Author pointed out the topic of flood legend from *Matsya Purāṇa*. She described the flood stories mentioned in Sanskrit literature.

Articles –

1] **'*The Matsya Purāṇa*'** by Harsh Nevatia

He discussed Manu-Matsya conversation, architecture, sculpture, Hinduism and environment, and fish incarnation.

2] **'*Matsya Purāṇa*'** from Indianetzone.com

Here, different subjects mentioned in MP, are given in brief. Manu-Matsya story is discussed in brief.

3] **'*Fair Dealing in Copyright: The Matsya Purāṇa Version*'** by Shefalika Ghosh

Author took efforts to show a new point of copyright found in MP. She discussed the *pañcalakṣaṇas* of *Purāṇas*, the story of *Kacha* and *Devayāni* told by *Lomaharṣaṇa* to the sages. She explained the derivation of copyright of subsequent doctrine of fare dealing. She concludes that every reading may throw some new light on the traditional knowledge of rules, regulation and practices. This can even be followed today to uphold our rich heritage of traditional knowledge.

4] **'*Darwinian Daśāvatāras*'** by Vinod M. K.

Vinod has mentioned the scientific view of *Daśāvatāras.* He states that the *Daśāvatāras* seem to have given us the theory of evolution, even though in a different package, long before Darwin's time. He has shown the gradual development of *Daśāvatāras* in relation to the evolutionary developments of animal kingdom.

Here, a list of some articles on MP studied in different views by many scholars is given.

1] *Yaṣka*-worship in the *Matsyapurāṇa* : Agrawal V. S. and Motichandra

2] *Saptasāgarmahādāna* : Agrawal V. S.

3] *Nārāyaṇamahārṇava* : Agrawal V. S.

4] A Study of the Textual Peculiarities of the *Śarada* Ms of the *Matsyapurāṇa* : Gupta A. S.

5] The Stories in the *Matsyapurāṇa*, An Analysis : Gupta A. S.

6] The Manuscripts of *Matsyapurāṇa* collated for the project critical edition of the *Matsyapurāṇa* : Gupta A. S.

7] Textual Notes : Gupta A. S.

8] Gleanings from the *Matsyapurāṇa* : Raghavan V.

9] A Unique Two-khanda-version of the *Matsyapurāṇa* : Raghavan V.

10] On some Readings of the *Matsyapurāṇa* : Sen Nilmadhav

11] A Metrical Analysis of the *Matsyapurāṇa* : Swaminathan C. R.

There are many scholars, who studied the MP in different views. On the basis of different subjects described in MP, some have studied total 291 chapters. Kantawala has studied the cultural history of MP whereas Agrawal V. S. has criticized MP chapter vise with different aspects of philosophy, duties of kings, politics, *sṛṣti-vidyā* and *Bhūtadayā*. Diksitar VRR has concentrated on some selected points of MP. No one had studied the MP in reference to scientific views. No one had tried to find out the origin of *Matsya* incarnation, its relation with environment and evolutionary developments.

Some scholars took efforts to focus on the water deluge and natural sources of the earth which are described in MP, but no one has travelled from the origin of *Matsya* up to the whale. No one has tried to find out the reasons, why Lord *Viṣṇu* had selected the *Matsya*,

what is the relation of *Daśāvatāras* with the evolution of animals, what is the modern relevance of *Matsya*. That's why the deep study on the evolution of *Matsya* is undertaken. Here, efforts are taken to show the modern relevance of *Matsya* with whale and evolution of animal kingdom. This study focuses in the hidden scientific views of MP, awareness and conservation of environment before thousand years ago, which is the main issue for global environment.

1.11 Limitations of the Study

Here, the study of MP is undertaken from the point if view of science. So the religious and political topics from MP are dropped. Due to the limitations of the thesis, other references of *Matsya* found in ancient literature are not selected.

From the above discussion, *Bhūtadayā* it is clear that *Matsya* plays an important role to find out the hidden scientific views in MP. Manu-Matsya conversation shows the awareness about the animal conservation i.e. *Bhūtadayā.* Any *avatāra* of Lord *Viṣṇu* protects the Universe from dangerous demons or evil things.

Thus, MP shows its special place in all *Purāṇas* and it has attracted the researchers due to its traditional stories having scientific views.

References

[1] यो विद्र्याच्चतुरो वेदान् साङ्गोपनिषदो द्विजः । न चेत् पुराणं संविद्यान्नैव स विचक्षणः ॥

[2] ChUp – 7.1-2

[3] Agrawal V. S.- *Matsya Purāṇa* : A STUDY, Intr. p. 4

[४] यस्मात् पुरा ह्यनतीदं पुराणं तेन तत् स्मृतम् । *VāP - 1.20*

[5] MP. ch-53, verse-164

[6] BP – 11.7.9-10

[7] AV - 11.7.24

[8] एवमिमे सर्वे वेदा निर्मिताः सकल्पाः सरहस्याः सब्राह्मणाः सोपनिषत्काः सेतिहासाः सान्वाख्याताः सपुराणाः। GB - *Pūrvabhāga* – 2.10

[9] धुवायाश्चोर्ध्वायाश्च पुराणवेदम् । GB - *Pūrvabhāga* – 1.10

[10] यद् ब्राह्मणानीतिहासान् पुराणानि कल्पान् गाथा नाराशंसीर्मेदाहुतयो देवानामभवन् ।

Tai Ar – *Prapāthaka -2*, *Anuwāka-9*

[11] इतिहासपुराणः पञ्चमो वेदानां वेदः । ChUp – 7.1.4

[12] स यथार्द्रेन्धनाग्नेरभ्याहितात् पृथग्धूमा विनिश्चरन्ति, एवं वा अरेऽस्य महतो भूतस्य निःश्वसितमिद् यदृग्वेदो यजुर्वेदः सामवेदोऽथर्वाङ्गिरसः इतिहासपुराणम् । Brh - 2.4.11

[13] इतिहासपुराणाभ्यां वेदं समुपबृंहयेत् ।

[14] मुख्यैरवगृहीतं वा राजानं तत्-प्रियाश्रितः ।
इतिवृत्तपुराणाभ्यां बोधयेदर्थशास्त्रवित् ॥ Artha*śāstra*. – 516

[15] पुराण-न्याय-मीमांसा धर्मशास्त्रांगमिश्रिताः ।
वेदाः स्थानानि विद्यानां धर्मस्य च चतुर्दशः ॥ *Yā Smṛ* – 3.1-3

[16] Upadhyaya Baladeva - *Purāṇa Vimarṣa, 1st Parichaya, p. 36*

[17] MP – ch – 3.3

[18] आख्यानैश्च्याप्युपाख्यानैर्गाथाभिः कल्पशुद्धिभिः।
पुराणसंहितां चक्रेपुराणार्थविशारदः ॥ *VāP* – 3.6.15

[19] MP – ch – 53.4-11

[20] *Purāṇavarma – Samayapāda*, p. 21

[21] Kantawala S. G. – Cul. Hi. from MP, introduction, p. 6

[22] vide *Kalyāṇa*, 1950 – '*Hamare Purāṇa*' by A. D. Pusalakar, Pp 551-52

[23] Kane P. V. – *History of Dharmaśāstratra*, p.15

[24] Diksitar VRR - Matsya *Purāṇa*, A Study, Pp. 71-72

[25] Shastri Durgashankar K. – *Purāṇa -Vivecana*, p. 180

[26a] vide Diksitar VRR – *Purāṇa-Index,* Introduction, MP, p. xxiii

[26b] Diksitar VRR – MP, A Study, p. 24,
vide Cul. Hist. of MP - Kantawala S.G., p. 4

[27] MP – ch – 53.12-24

[28] MP – ch – 53. 58-63

[29] *Matsya Purāṇa, A Study* by Diksitar VRR, Pp. 19-20

[30] vide A descriptive catalogue of Sanskrit MSS in the collections of the Asiatic Society of Bengal vol.- V, by Shastri Hariprasad, [PMSS] Preface p. xc

[31] एकः स्थास्यसि देवेषु दग्धेष्वपि परन्तप । सोमसूर्यावहं ब्रह्मा चतुर्लोकसमन्वितः ।।
नर्मदा च नदी पुण्या मार्कण्डेयो महानृषिः । भवोवेदाः पुराणाश्चविद्याभिःसर्वतोवृतम् ।। MP – ch- 2.13-14

[32] BP – 12.7.23

[33] MP – ch -53.67-68

[34] *VāP* – 12.484

[35] स्कन्दं पुराणं लोमानि त्वगस्य वामनं स्मृतम् । कौर्म पृष्ठं समाख्यातं **मात्स्यं मेदः प्रकीर्त्यते** ।।
PP, *Swargakhanda* - 62.2-7

[36] MP – 2.22.24

[37] vide *Purāṇa,* from History of *Dharmaśāstra* by Kane P. V.

[38] Kantawala S.G.- Cul. Hi. of MP, p.12

[39] Willson H. H. – *The Matsya Mahapurāṇa*, ch – 1 p. 3

[40] vide an article from *Avatāra kathānka* – Avatara Ki Sarthakata Aur Usaka Rahasya, Pp 67-68

[41] अवे तॄस्त्रोर्घ [3.3.120] P*āṇ*ini

[42] BG – 4.7-8

[43] MP – ch – 47.3

[44] SB – *Matsya* – [1.8.1.1], *Kūrma* – [75.1.5, 14.1.2-11], *Varāha* – [14.1.2.11]

[45] MBh – [3.18], [12.340]

[46] BP – *Skaṇda*-8, 24.11-617, AP – 2.49, GP – 1.142, PP – 5.4, MP – 1.2

[47] Indian Divinity.com, *Matsya Avatāra*

[48] Joshi Mahadevsastri - BSK, vol.- 6, *Matsya Avatāra*, p. 685

[49] vide article 'Bhagwana ke saguna swarupa aur avatara' published in *Kalyāṇa* -'*Hiṇdu Sanskriti Aṇka*' 1950, p. 796

[50] vide an article by Pt. Shukla Sriramaghar- '*Bhagawāna Matsya*' published in '*SRĪ VIṢṆU AṆKA*' of *Kalyāṇa* Magzine 1973, p. 292

[51] Agrawal V.S. – MP: A Study, p. 4

[52] _____,,_____ ____,,____, p. 5

[53] MP - 1.18-34

[54] MP - 1.18

[55] MP. 1. 20-26

[56] Agrawal V. S. - MP: A Study, p. 3

[57] MP – 1.29-34

[58] Seven ordinary rays of the Sun which shall become seven times more powerful. 7 rays of the Sun – [1] Susumna,[2] Harikesa, [3] Viswakarma, [4] Viswayaca, [5] Samyagvasu, [6] Udagvasu and [7] Suraha.

[59] *Śeṣa* - Universe rests on the head of a thousand hooded serpent which is more popularly known as *Śeṣa.*

[60] MP – 2.5, Willison H. H.- *The Matsya Mahapurāṇam*, p. 8

[61] सम्वर्तो भीमनादश्च द्रोणश्चण्डवलाहकः । विद्युत्पताकः शोणस्तुसप्तैते लयवारिदाः ।। [MP – 2.8]

[62] vide Agrawal V. S. - MP : A Study, p. 4

[63] MP – 2. 10

* *Ekārṇava* – A condition of deluge when *Brahmā* emerges out of the waters, enveloping the Universe. The Lord becomes *Avyakta*.

[64] Agrawal V. S. - MP : A Study, p. 4

एतदेकार्णवं सर्वं करिष्यन्ति जगत्त्रयम् । वेदनावमिमां गृह्य सत्ववीजानि सर्वशः ।।१०।।

आरोप्य रज्जुयोगेन मत्प्रदत्तेन सुव्रत । संयम्य नावं मच्छृंगे मत्प्रभावाभिरक्षितः ।।११।। MP – 2.1.11

[65] एकः स्थास्यसि देवेषु दग्धेष्वपि परन्तप । सोमसूर्यावहं ब्रह्मा चतुर्लोकसमन्वितः ।।१२ ।।

नर्मदा च नदी पुण्या मार्कण्डेयो महानृषिः । भवोवेदाः पुराणाश्चविदयाभिःसर्वतोवृतम् ।। १३ ।।

त्वया सादर्धमिदं विश्वं स्थास्यत्यन्तरसंक्षये । एवमेकार्णवे जाते चाक्षुषान्तरसंक्षये ।। १४।। MP. 2.12-14

[66] vide *'SriDaśàvatàrastotram'* by Jayadeva, *Kalyaṇa Viṣṇuaṇka,* p. 8

[67] vide Indian Divinity.com/Hindu Trinity/ *Viṣṇu*

[68] Agrawal V. S. - MP : A Study, glory of *Nārāyaṇa,* p. 263

[69] MP – ch - 164.24

[70] MP – ch - 164

[71] vide M_K_Vinod blogs on sulekha.com/Darwinian *Daśāvatāras*

[72] vide Sa Eng Dict By MW, *Dwāpara*, col.1, p. 854,

[73] वीर्यं तेजो बलं चाल्पं मनुष्याणामवेक्ष्य च । हिताय सर्वभूतानां वेदभेदान् करोति सः ॥ ViP – 3.3.6

[74] MP – ch – 53.9, and ViP – 3.3.5

द्वापरे द्वापरे विष्णुर्व्यासरूपी महामुने । वेदमेकं सुबहुधा कुरूते जगतो मुनिः ॥

[75] Joshi Mahadevsastri – BSK, vol.- 9, p. 15

व्यासं वसिष्ठनप्तारं शक्तेः पौत्रमकल्मषम् । पराशरात्मजं वन्दे शुकतातं तपोनिधिम् ॥

[76] Wikipedia.com / *Vyāsa*

[78] Kolhatkar K. K. - *Maharṣi Vedavyāsa - Avatāra, Kārya, Tattvajñāna, Pp* 34-35

[79] त्रीभिर्वर्षैः सदोत्थायी कृष्णद्वैपायनो मुनिः । महाभारताख्यानं कृतवानिदमुत्तमम् ॥ *Ādiparva* – 5.6.32

[80] Wikipedia.com / *Vyāsa*

[81] Joshi Mahadevsastri – BSK, vol - 9, p.161

[82] व्यासाय पाराशर्याय । [SB- 3.9.8]

स होवाच व्यासः पाराशर्यः [Tai Ar – 1.9.2]

[83] *Pāṇinī's Aṣṭādhyāyī* - 4.3.110

CHAPTER – 2
ORIGIN OF THE UNIVERSE

2.1 Introduction

Hindu Vedic religion, in its account of creation of the universe, has been very positive and scientifically presented. It is rare for a religion to describe scientifically with critical account how the universe came into existence and about its origin and nature. The Vedic religion has been very out spoken. The origin of cosmos cannot be known but the condition of ordered life can be well known. Hymn of Creation[1] says the truth, such a clarification is rare to find on earth.

Cosmogony means an understanding of the universe, reflection on, and account of it. It should explain the underlying structure or the incarnation and its purpose; how the cosmos came to appearance and an orderly form came up and to what extent.

It is evident that every definition proceeds from cause to effect. God is the efficient cause, the cause of all causes and also a material cause. God is the primary efficient cause. He governs all and creates the universe, sustains it and dissolves it. [Ch Up (6-2) says, 'Before creation, the universe was existent.' Brh (1-4-1) says, "It was all spirit".]

2.2 Birth of the Universe [*Brahmāṇḍa*]

2.2.1 Mythology

In the Mythology, Universe is considered as golden egg and this Universal egg is known as *Aṇḍa* or *Virāja*. The creation of

golden egg is a doctrine very familiar to the *Purāṇa* writers. The MP explains in a nut shell the doctrine of the birth of the cosmos in the form of the golden egg.[2] A research scientist, Raja Ram Mohan Roy comments about the expanding Universe that concept of the universe as an egg is found in nearly all ancient civilizations, the source of which is obviously the RV. The universe is described as an egg in most post-Vedic scriptures. He explains the etymology of *Brahmāṇḍa* that 'The word for universe in Sanskrit is "*Brahmāṇḍa*", which is made by joining of words "Brahma" and "*aṇḍa*". Brahma is derived from root "*Bṛha*" means to expand and "*aṇḍa*" means egg. Thus "*Brahmāṇḍa*" means expanding egg.[3]

Lord *Matsya* determined this origin of the Universe and re-creation in second and third chapters of MP. *Matsya* said that during the period of dissolution the universe was enveloped in darkness and was in a state of trance [unaware of the environment], in which Lord *Svayambhū* [4] known as *Nārāyaṇa* appeared to create the Universe[5] [fig. 5]

He deposited this cosmic seed for creating the world. It was a dead egg, *Svayambhū* himself entered the egg. This is referred to the doctrine of *Aṇu-praveśa* in MP.[6] As explained above the golden egg is named *Brahmāṇḍa*, *Jagadādya, Mārtaṇḍa, Virāja-aṇḍa* etc [vide fig. 6]. This means the cosmos in the egg which is Divine and Golden including moon, sun, galaxies and planets was inside the egg. Egg was surrounded by ten qualities from outside.[7] This Golden Egg floated in the ocean for duration of one thousand years. At the end of thousand years Egg was divided in two by *Vāyu*[8] and became ten

thousand times more luminous than the sun[9]. *Svayambhū* merged himself into that *Brahmāṇḍa* to create the Sun by his glory. As the Sun is its first creation, known as *Āditya*. In the Golden Egg, seven *Pitṛs* or ancestors were born which are referred as *Mahat*, *Ahaṅkāra* and the five *tanmātrās* [subtle objects of sense pleasure]. The sap of Egg is assumed seven particular aspects for the evolution of seven principles i.e. *Mahat, Ahaṅkāra* and five *tanmātrās.* [10] From the two halves of Egg heaven and earth were made.

2.2.2 Western Literature

An evidence of *Purāṇic* concept, origin of the Universe from *Hiraṇyagarbha*, is found in the literature of ancient Syria, Egypt Persia and Greece. The reference of 'Orpheus' Egg from Greek literature is also quotable. Aristotle and Plato agreed this concept of Birth of Universe and Rebirth. According to them, this Universal deluge affects maximum on the earth, the half part of the moon and another half part of the moon i.e. *Devaloka*, which remains neutral.[11]

2.2.3 *Hiraṇyagarbha* (Golden egg)

About the golden form of the *Brahmāṇda*, Agrawal V.S. remarks that in Vedic Symbolism. *Hiraṇya* symbolizes the principle of *Taijasa* or light shining forth from within the womb of darkness. *Hiraṇya* is the *Jyotih* of Brahmin which is visible to us as *Prāṇa*, as *Āditya,* as *Iṇḍra*, as *Agni* etc.

According to BP, a very important fact about the *āṇḍa*, is stated that the Egg was lacking of life until the Divine Principle

quickened it with its potency and then Egg became infused with life.[12] BP also stated that the cosmos is the visible form of the Creator भगवतः स्थूल-रूपम्) .[13]

Three stages in the birth of the Egg –

1.Egg floats in water. Here water symbolizes the principle of motherhood, the basic sap of creation. This is described as the ocean of Soma in the *Vedas* (*Salilam)*. It is clearly stated in the SB giving an account of Vedic cosmogony that the water existed in the beginning as the primeval mother principle. आपो ह वाऽइदमग्रे सलिलमेवास।[14]

This is described as ocean of Soma in the Vedas. Agrawal compares this Soma with the fluid inside the fetus of the mother's womb. That is Soma according to the Indian conception representing the sap of life for the fertilized ovum. What happens in the womb of human mother is a phenomenon present in the womb of every other mother or in the universal principle of motherhood. This universal Soma filters within the ordered Surya and is constantly supplying energy to the system of the life-principle developing within it. Soma is the principle of food and life is the principle of Agni. Soma and Agni exist together. Soma is the mother and Agni is its Baby.[15]

According to the opinion of gynecologist, after fertilization of the egg, when a fluid is prepared in fetus then only the egg enters in the fetus. Still it remains in ovarian tube about five to seven days.[16] It shows that Egg is immersed in the liquid fluid for new creation [vide fig. 7]

2. Second feature of the Egg is Agni as the life principle of *Prāṇa*, which is present in the Yolk of the egg as the nucleus that becomes effective in the form of the process of contraction and repulsion which controls assimilation and elimination and manifests as live cell.

3. Third principle is growth (*Mahimā*), which is present within the egg together with Agni and Soma. As a result of which *Aṇu* becomes *Virāta*. According to Agrawal, the striding of *Viṣṇu* which is later on woven into the significant legend of the *Trivikrama* incarnation is the motive force of the dynamic principle of movement that is demonstrated as growth in every living organic centre.[17]

वामनो ह विष्णुरास[18] स हि वैष्णवो यद् वामनः[19]

After the creation of the Sun, *Svayambhå* divides the *Brahmāṇḍa* into two parts to make heaven and earth. Upper portion of the egg is Heaven and lower is earth [fig. 8]

दिविं भूमिं समकरोत्तदण्डशकलद्वयम् ।[20]

Afterwards directions, the principle mountains, clouds, embryo, rivers, *pitṛs*, Manu and the seven oceans[21] in which full of various gems were created.[22]

From above discussion, it can be stated that Golden Egg or *Brahmāṇḍa* floated in the water which is the same with that of *Matsyāṇḍa*- the fish egg. Here, there is similarity in the birth of the Universe and the birth of fish– the first unit of animal kingdom. Not only this, but there is very close resemblance between the developing child in the womb called fetus and the *Brahmāṇḍa*. It is very surprising that these microscopic details had been observed by ancient writers. From this, the mother is Soma, the father is Agni and the child

growing from the womb is the symbol of the principle of growth or *Mahimā*. *Varuṇa* is the ruler of Soma or watery principle, *Iṇḍra* is the ruler of *Agni* and *Viṣṇu* is of *Mahimā*. There are the great duties of *Viṣṇu* who combines in the manifestation of life both slight and gross forms.

2.3 Geological History of the Earth

In all ages historians and scientists have given serious thought to historical aspect of the earth, its origin and development. By the mid of 1800's AD. geology* had become an important science. The work of geological surveys pointed out this important fact different rock strata and fossils in them follow the same general order throughout the world. This made possible to draw up a geological time table for the whole earth.[23] [vide table 2.1]

2.3.1 Darwin's Theory of Evolution

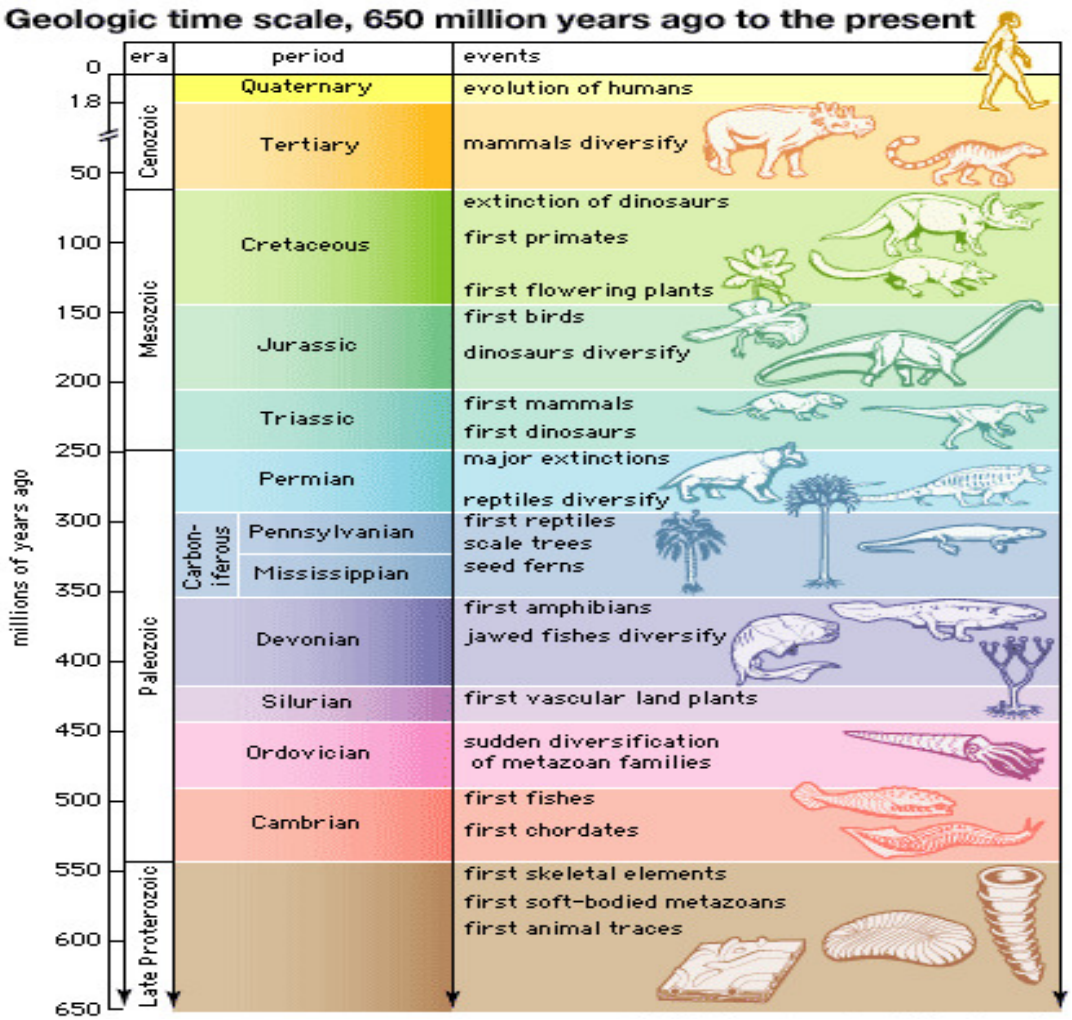
The English naturalist Charles Darwin (1809 – 1882) developed his ideas about evolution into a proper scientific theory.[24] In 1859, Darwin announced his theory of evolution in which he says that fossils showed how plants and animals evolved gradually over millions of years from primitive forms of life. In his book, 'The Origin of Species' he explains the principle of natural selection[25] which is one of the main ideas in the theory of evolution.

2.3.2 Origin of the Earth – [vide table 2.1]

Radiometric dating of meteorites revealed that the earth, like other bodies of the solar system is about 4,600,000,000 [4.6 billion] years ago. Very rare fossils show that the first animals were probably Cambrian period animals with hard body cases, such as trilobites and first fishes and Chordates in sea and lakes. First land dwelling creatures were also amphibians. Jawed fish diversity was found in this period. First reptiles evolved by 300 million years in carboniferous period.[26] Around 250 million years ago, in Triassic period first dinosaurs and first mammals spread across the land. In Jurassic period, 150 million years ago dinosaurs diversity spread across the land and birds were originated first.

Another great extinction 65 million years ago killed off dinosaurs and many other reptiles, as well as sea animals. In the tertiary period, 50 million years ago, mammals diversified greatly and aquatic mammals – whales inhabited in polar and deep oceans. Last in quaternary period 18 million years ago, first humans walk on land took place.[27]

Thus, this origin and history of the earth shows that fish like worms or fish are the first originated animals on the earth and from their gradual developments at last humans are developed. This first and last unit of development was directly shown by Lord *Viṣṇu* through fish incarnation which is half Matsya and half human.



Fossil record : geological time scale showing major evolutionary events.

2. 3. 3 Evolution

Biological evolution is a process of descent with modification. Lineages of organisms change through generations; diversity arises because the lineages that descend from common ancestors diverge through time.

The history of life recorded of fossils presents completing evidence of evolution. Animals and plants adopt themselves in their environment. They are well suited to their

environment will survive best and pass on their characteristics to the following generations. Scientist can look back into history and show that all species come from the same ancient parents. Each living thing in a blend of older and newer features and each species is always developing and adopting.[28] Thus the infinite variations on life are the fruit of evolutionary process.

Ayar Narayanaswami explained some brief comparisons between ancient and the new theories of evolution, in his book '*Purāṇas In The Light of Modern Science*.' The moderns taking into consideration the material aspect alone find a regular progression taking place in the bodies of plants and animals till they come to man. He pointed out that the evolution of matter is designed for the unfolding powers of the *Supreme Paramātmā*. It is stated in *Purāṇas* that *Brahmā* made a *ṭapas* through which he willed the forms to be in the condition in which they are now.[29]

He differentiated the East and West theories. According to the theory of the West, man can be traced from the vegetable and even from the mineral. This is admitted in the East, as having obtained in the *Svayambhūva Manvantara* or first period. It says that that order obtained in the early stages of Creation; but on this solid earth of ours, a reverse order obtained which may surprised the non-thinkers.[30] If we study the origin of *Vaivaswata Manu* on this earth of ours, we find that there was a *Prajāpaṭi* or progenitor, who was called *Dakṣa*. Thirteen daughters of his *Aditi*, *Diti*, *Danu* etc., married *Kaśyapa*. *Aditi* brought forth *Vivaswān*, the present sun from whom came *Vaivaswata Manu*, *Kadru*, serpents; *Vinatā*, eagles; *Ilā,* plants; and so on.[31] Modern embryology supports this apparently impossible to the

form of a human being repeats, through all the changes in the fetus that which it underwent in the previous eons of evolution.

At last Ayar remarked, the eastern theory makes evolution complete, while it is incomplete in its western presentations. Thus eastern starts the evolution of the unit from the *Ahaṅkāric* units arose from Mahat with the potentiality of evolving to the whole. But western theories neither tell us whence the mineral came nor into what state does man go. Eastern gives us stage after stage of progress, after man, through superhuman evolution, till at last we go back to the fountain-head *Paramātmā*.[32]

2.3.4 Fossil study

Fossil is preserved remains of animals or plants. The remains of an animal or plant present from an earlier era inside a rock or other geologic deposit, often as an impression or in petrified state. Fossils help scientists to understand how life on the earth grew from a few tiny living things to the great variety we know today.[33] [vide fig. 9] This fossilized ichthyosaurus was found in Germany and dates from the early Jurassic Period, about 185 million years ago.

Before 3400 million years ago, in the pre Cambriaonic period prokaryotes and single called micro-organisms were able to photosynthesize, which produce oxygen. 1000 years after soft bodied jellyfish, corals and sea-worms were found before the beginning of Devonian period.

Fossils make it possible to estimate the time period when the rocks and the fossils associated with them were formed. The

oldest known animal fossil, about 700 million years old, small worm like creatures with soft bodies.

2.4 Flood Legends of Western Country

Like that of *Purāṇic* flood legend, history of many western countries stated the flood legends happened to dissolute the world and recreate the new world from the water. Here some important historical western flood legends are discussed in brief to show the one and same principle in the origin of the earth from the flood water and the history of development of the geology.

Biblical reference – [Babylonian history]

In Biblical genesis describes the well- known story of the creation of the world. It states that 'in the beginning, god created the heaven and the earth. The earth was not formed and empty, the darkness covered the abyss and the spirit of god blew over the water. These last words suggest that the earth originally passed through a state of aqueous liquidity.[34] The work of creation was completed in six days in which on first day the light is created. Throughout the Bible the transcendent god is referred by the sign of light. Where as in firstly the sun is created. There were 30 million species on board while creationists estimate some 16,000 to 30,000 population founders on board Noah's ark.

Perhaps the second most important historical account of a global flood can be found in a Babylonian flood story in the Epic of Gilgamesh. When the Biblical and Babylonian accounts are compared, a number of outstanding similarities are found that leave no doubt these stories are rooted in the same event or oral tradition.

Some geologists believe that quite dramatic, unusually great flooding of rivers in the distant past might have influenced the legends. A news article from National Geographic News February 2009 reported that the flooding might have been quite mild.[35]

K. A. Von Zittel explains the ancient stories of creation on the basis of Babylonian and Jewish accounts. Alexander [611 B.C.] states an infinite all pervading primeval substance posses in an inherent power of movement from the first. He also explains that the earth rested in the center of the whole universe and human beings were at first fish like in forms consisted with the semi fluid state of their environment.[36]

According to Plato [427 B.C.] the universe is the production of divine intelligence and of the necessary development of nature.[37] A great philosopher and of Greek Aristotle remarked that the universe is divided into an earthly and heavenly half while the four elements – earth, water, air and fire compose the earth and the planets.[38] This concept is similar to *Pañcatanmātrās*.

John Woodward described that fossils represented past faunas and floras and he supposed these remains to have been carried to their present position in the earth by a universal flood, the deluge of Scriptures. He also concludes that before the flood, the earth's surface conformation had been similar to that which we now know.[39]

A study of cores of sediments found in the bottom of Gulf of Mexico has shown the evidence of a vast flood of fresh water into the Gulf of Mexico. It clearly shows that there was a major period of flooding from 12,000 to 10,000 years ago. There was no question

that there was a flood and there is no question that it was a **universal flood**.[40]

All above discussed opinions proves the basic concepts of origin of earth, described in *Purāṇas,* is same with ancient geologist of western countries. Modern geological researchers support to the theory of occurrences of floods and devastation of the land by the erosion of the sea as in Western Asia, Southern India and other parts of the world. Traditionally in the world every country has same version of flood or the flood legends.

According to the chronological table drawn up by the Pavan chronicler in 265 B.C. the deluge is said to be dated in the year 1539 B.C.[41] Diksitar points out to view that Indus people must have migrated to Elam, Tunis, Babylon and even to the Egypt.[42] About this migration there are two opinions that one is the migration of the culture must have been from the Indian home rather than the other way about. Second one is there is evidence of pottery. It may be happened that the Sumerians took with them the Indian Potter's art from Sind.[43] According to Diksitar, if this assumption of migration from India be correct, the Vedic legends as seen in SB, was the origin of other flood legends. According to Hindu literary tradition the flood legends of western countries were partial deluge and not a *Mahāpralaya* which enveloped all the words.

2.5 Development of Matsya

According to geological time scale before 540 million years ago evolution of chordates occurs in cambrianoic period. In this

period fishes are diversified maximum up to Devonian period to this period and this is known as the age of fishes.

Armored limbless fishes are called as Ostracoderms. They have no genes and gill slits are used for respiration. These are the first vertebrates having a backbone or spinal column.

In Devonian period fishes diversified into jawed fishes, joint necked fishes and armored like modern sharks. They became extinct by the close of the Devonian illustrating the lane of evolution. These developed into bony fishes having hard bony skeleton. In the mid Devonian period cartilaginous fishes developed very well having real jaws, paired limbs and had cartilaginous skeleton on the body.[44]

Lung-fishes in the Devonian were a group of Mud-fishes. They had limbs and swim-bladders as lungs. These lung-fishes had balloon-like sac filled with air, called the swim-bladder.

According to evolutionary process, the useful features were developed into fishes, which were helpful to them for surviving in their inhabitants. According to the habitat of fishes, shape, food and size of the fishes had many variations as a result a variety of diversity was produced.

According to the evolution of fish, the Matsya development occurs in the second chapter of MP, where Manu protected the *Śapharī* - small carp and changed its habitat according to the growth of that *Śapharī*.[45] This development shows many similarities to the evolutionary development of fishes[46] [for details vide chapter-1 Manu-Matsya conversation]. This proves that why *Purāṇas* are said to the real sources of different scientific studies.

If the Matsya development based on MP is considered true in shape and size, modern species of fishes found in different habitats are compared with that of fishes which developed fast as Manu changed their habitats. MP mentions exact measurement of developing fishes, coincidently which match with some modern species. This comparative study is shown below, which is described systematically in the table 2.2.

Over and above this, *Purāṇic* writers were familiar to the science and evolutionary developments at their level in traditional way. There was awareness about the protection of animals and environments which is explained as *Bhūtadayā.*

No.	Length of the Matsya in MP	Habitat – MP	Modern class	Habitat Ichtho-logy	Special features of fish
1	Very small fish [Saphari] [3-4 cm]	Manu's hand/ Kamndal-u	Agnatha Jawless fish	Fresh water	1st vertebrates No true jaws Filter feeding mouth
2	16 fingers [8-10 inc.]	Jar	Gnathostom-ata Jawed fish [Placodermi]	Fresh and salt water	Mouth jawed, paired fins and scales
3	2 hands [5-7 feet]	Well	Chondricthy-es Cartilaginou-s fish	Salt water	Skeleton of cartilage, live mainly in salt water
4	1 Yojana [8 miles]	Tank	Osteichytes [Teleostei] Bony fish	Fresh and salt water	Skelton of bone, rayed fins
5	-- [50-80 feet]	Ganges	Cetaceans [Giant Whale]	Polar regions	Aquatic mammals, large in size
6	200 Yojanas [1600 miles]	Entire Ocean	Matsya Incarnation of Visnu	--	Half fish and half man i.e. features of Whale

Table : 2.2 Development of Matsya according to MP and Ichthyology.

References

[1] *Nāsadiya Sūkta* of RV (10-129)

[2] जगदण्डमिदं पूर्वमासीद् दिव्यं हिरण्मयम् । प्रजापतेरियं मूर्तिरितीयं वैदिकी श्रुतिः।। MP - 248.1

[3] vide world-mysteries.com/science mysteries/ancient science, ibid 'Vedic Physics' by Raja R. Roy

[4] नोत्पादितत्वात् पूर्वत्वात् स्वयम्भूरिति चोच्यते । *VāP* – 4.44

[5] महाप्रलयकालान्त एतदासीत्तमोमयम् । प्रसुप्तमिव चातर्क्यमप्रान्दातमलक्षणम् ।।25।।

अविन्देयमविान्दातं जगत् स्थास्नुचरिष्णु च । ततः स्वयम्भूरव्यक्तःप्रभवःपुण्यकर्म्मणाम् ।।26।।

यः शरीरादभिध्याय सिसृक्षुर्विविधं जगत् । नारायण इति ख्यातः स एकः स्वयमुद्वभौ ।।27।।

MP – 2.25-27

[6] प्रविश्यान्तमहातेजाःस्वयमेवात्मसम्भवः । प्रभावादपितल्व्याप्त्याविष्णुत्वमगमत्पुनः ।।30।। MP – 2.30

[7] *VāP* - 4.72-73

[8] *VāP* - 24.73

[9] संवत्सरसहस्रेण सूर्य्यायुतसमप्रभम् । MP – 2.29

मुमोचाण्डं महायोगी घृतं वर्षसहस्रकम् । MP – 247.43

[10] सप्तयेऽमीसमुद्राश्च तेऽपिचान्तर्जलोद्भवाः । MP – 2.34

[11] vide Pracina Bhartiya Sthalkosa by Chitrava Shastri, preface Jagadutpatti, Pp 39-40

[12] and [13] BP – 2. 2. 1. 23

[14] SB – 11.1.6.1

[16] Agrawal V.S. – MP : A Study, p.6, Author discussed with Gynecologist Dr. Sujata Nagapurkar from Aurangabad,

[15] MP – 2.32

[16] 7 Oceans – क्षीरोदः, लवणोदः, युदः, घृतोदः, सुरोदः, चक्षुदः, स्वादुदः ।

[17] MP – 2.34

[18] Geology – This branch of science which studies the early signs of life by the help of biological surveys which show the different rock strata and the fossils in them follow the same general order throughout the world.

[19] NBK – vol.-7, p. 119

[20] On. DVD / Charles Darwin

[21] Natural Selection- It occurs because individuals having more useful-traits, such as more acute vision or swifter legs, survive better and produce more progeny than individuals with less-favorable traits.

[22] The Children's Ency., The living world, p. 48

[23] vide the table 2.1

[24] The Children's Ency., Earth and Space, p. 32

* On. DVD, the table of fossil record showing geological time scale.

[25] The Children's Ency., Record in Rocks, p. 39

[26] Francois E. - History of Geology, vol. – 1, p. 46

[27] Wikipedia.com/deluge myth Hypothesis of the flood legends.

[28] Von Zittel K. A. – History of Geology and Palaeontology, p. 5

[29] ibid, Introduction.

[30] for details vide earthage.org/Scientific Evidences for a Worldwide Flood.

[31] Diksitar V.R.R. – MP A STUDY, p. 10

[32] ____ ,, _____ – ____ ,,_____ , p. 13

[33] _____ ,, _____ – _____ ,, ____, p. 14

[34] Randhawa Singh, Dey and Mittre – Evolution of Life, p. 88

[35] MP – 2.19

[36] MP – 2.19-26

[37] Von Zittel K. A. – History of Geology and Palaeontology, p. 6

[38] _____ ,, ____, ____ ,, _____, p. 7

[39] _____ ,, _____, _____ ,, ___ , p. 5

[40] www.icr.org/flood legends

[41] Diksitar V.R.R. – MP A STUDY, p. 10

[42] ___ ,, _____ , ____ ,, _____ , p. 13

[43] ____ ,, ____ , _____ ,, _____ , p. 14

[44] Randhawa Singh, Dey and Mittre – Evolution of Life, p. 88

[45] MP – 2.19

[46] MP – 2.19-26

CHAPTER – 3

MATSYA IN SANSKRIT LITERATURE

In the *Purāṇic* literature, *Matsya Purāṇa* occupied important place because of *Matsya* incarnation of Lord *Viṣṇu*. Recitation of MP in this *Matsya avatāra* by Lord *Viṣṇu* made *Matsya* image great and distinct in the mind of people. The importance of *Matsya* is not limited only up to *Purāṇic* literature but it found in various types of Sanskrit literature such as *Jyotiṣa śāstra, Āyurveda, Mahābhārata* etc.

In this *chapter*, *Matsya* found in other than *Purāṇic* literature is discussed.

3.1 Introduction of Jyotiṣa Śāstra

Jyotiṣa śāstra is the oldest of sciences, now a days known as Astronomy and Astrology[1]. *Jyotiṣa* is the science about the stars and heavenly bodies such as the Sun, the Moon, the other planets, and the stars etc. From very ancient days, people believed that these planets and stars in the sky played an important part in controlling the growth and activities of all the living and non-living beings in the world[2].

Richard Thompson states that *Jyotiṣa śāstra* presents the parameters and computational rules for predicting planetary positions and other astronomical phenomenon[3].

The *Vedas* are supposed to have six *Aṅgas – Śikṣā, Kalpa, Vyākarana*, *Jyotiṣa, Chanda*, and *Nirukta*[4]. From this it can be

said that the Indians had acknowledged Astronomy as an ancillary (*aṅga*) of the *Vedas. Jyotiṣa śāstra* is very useful to decide correct date and time of sacrifices and sacrifices are the main theme of *Vedas*. विनैतत् संस्कृतिर्यज्ञो व्यवहारो न सिध्यति । तस्माच्छुतीक्षणं पुण्यं पठनीयं द्विजोत्तमैः।।[5]

The expounders of Vedas say that Astronomy (JS) is the eye of the Vedas. ज्योतिषामयनं चक्षुः ।

Indian astrology has three branches -

1] ***Siddhānta***: , which is traditional Indian astronomy.

2] ***Saṁhitā***: also known as *Medini Jyotiṣa* (mundane astrology), predicting important events based on analysis of astrological dynamics in a country's horoscope or general transit events such as war, [*Vāstu Sāstra*,] animals, portents, omens etc.

3] ***Horā***: Predictive astrology based on analysis of natal horoscopes and the moment a query is made.[6]

The latter two are part of predictive astrology (*Phalita*). Therefore, Indian astrology has two branches, ***Gaṇita*** (*Siddhanta)* and ***Phalita*** *(Saṁhitā plus Horā*). Historically, the study of astrology in India was an important factor in the development of astronomy in the early middle ages.

JS (Astronomy) has two sides, the one is *Pramāṇabhāga* [doctrinal side] and the other is *Phalabhāga* [result side]. According to *Pramāṇabhāga* a calendar is designed and *Phalabhāga* is the prediction and casting of the horoscopes of living beings.

In Hindu culture, newborns are traditionally named based on their *Jyotiṣa* charts, and *Jyotiṣa* concepts are pervasive in the

organization of the calendar and holidays as well as in many areas of life, such as in making decisions made about marriage, opening a new business, and moving into a new home.

Chaphekar Avinash says that Astrology [*phala Jyotiṣa*] is based on the Astronomy [*Jyotiṣa śāstra*]. According to Astrology, the places of stars and planets in the sky, their motions and life of all living things on the earth, these are interrelated to each other.[7]

3.1.1 History of *Jyotiṣa śāstra*

Ancient Indian astrology is based upon sidereal calculations. It can be traced to the final centuries BC with the *Vedāṇga Jyotiṣa* attributed to **Lagadha** one of the circum-*Vedic* texts, which describes rules for tracking the motions of the Sun and the Moon for the purposes of ritual. After formation of Indo-Greek kingdoms, Indian astronomy was influenced by Hellenistic astronomy (adopting the zodiacal signs or *rāśis*). Identical numerical computations for lunar cycles have been found to be used in India and in early Babylonian texts. [8]

In Indian astrology, some great scholars stated the main basic theories. Around 500 AD, ***Āryabhaṭa*** presented a mathematical system. He also made an accurate approximation of the Earth's circumference and diameter, and also discovered how the lunar eclipse and solar eclipse happen. ***Brahmagupta*** (598-668) was the head of the astronomical observatory at Ujjain and during his tenure there wrote a text on astronomy, the *Brahmasphuṭasiddhānta* in 628. He was the earliest to use algebra to solve astronomical problems. ***Bhāskara*** (629) was the head of the astronomical observatory at

Ujjain, continuing the mathematical tradition of *Brahmagupta.* He wrote the *Siddhāntaśiromaṇi* which consists of two parts: *Golādhyāya* (sphere) and *Grahagaṇita* (mathematics of the planets).[en. Br.] Astronomy was advanced during the *Śunga* Empire and many star catalogues were produced during this time. The *Śuṇga* period is known as the "***Golden age of astronomy in India***".[9]

General astrology studies the relationship of the significant celestial moments (e.g., the times of vernal equinoxes, eclipses, or planetary conjunctions) to social groups, nations, or all of humanity. Astrology has been a recognized science in Egypt, China, and India from very ancient days. Drawings of the faces of the moon have been found in Spain. These drawings are about 10,000 years old. In Europe, 6,000 years ago, set up of huge stones used for the marking of places of the rising and setting of sun and moon. One well known group of these stones is at Stonehenge, in Southern England[10]. [vide fig 10]

A view from above the ruins of Stonehenge shows the arrangement of its ancient stones. In many ways, Stonehenge[11] is still a mystery to modern scientists and historians.

The spread of astrology beyond Babylonia is thus concomitant with the rise of a truly scientific astronomy in Babylonia itself, which in turn is due to the intellectual impulse afforded by the contact with new forms of culture from both the East and the West. In the hands of the Greeks and of the Egyptians both astrology and astronomy were carried far beyond the limits attained by the Babylonians.

3.1.2 *Rāśis* – the signs [zodiacs]

A zodiac divides the 360 degrees of the ecliptic into 12 equal parts, which have divided the sky are called 12 *Rāśis* or Zodiacs. Each twelth part i.e. a zodiac occupies 30 degree. The name of the zodiac is according to the sign of the zodiac. [vide fig. 12]

The term *zodiac* derives from Latin *zodiacus*, in turn from the Greek (*zodiakos kuklos*), meaning "circle of animals", derived from (*zodion*), the diminutive of (*zoon*) "animal". The name is motivated by the many of the signs of the classical Greek zodiac being represented as animals (six out of twelve, plus two mythological hybrids). Although the zodiac remains the basis of the ecliptic coordinate system in use in astronomy besides the equatorial one, the term and the names of the twelve signs are today mostly associated with horoscopic astrology.

मेषो वृषोऽथ मिथुनं कर्कः सिंहोऽथ कन्यका ।।
तुलाऽथ वृश्चिको धन्वी मकरः कुंभमीनकौ ।।
राशयस्तु क्रमादेते पुंस्त्रियौ क्रूरसौम्यकौ । [12]

The table 3.1of 12 zodiacs in the sky show their Sanskrit names, Western names, signs and their corresponding dates.

Table 3.1 Twelve Zodiacs with their signs

No.	Sanskrit Names	Sign	Western Names
1	*Meṣa*	Ram	Aries
2	*Vṛṣabha*	Bull	Taurus
3	*Mithuna*	Twins	Gemini
4	*Karka*	Crab	Cancer
5	*Siṁha*	Lion	Leo
6	*Kanyā*	Girl	Virgo
7	*Tulā*	Balance	Libra
8	*Vṛścika*	Scorpion	Scorpio
9	*Dhanus*	Bow	Sagittarius
10	*Makara*	Sea-monster	Capricorn
11	*Kumbha*	Pitcher	Aquarius
12	*Mīna*	*Fish*	*Pisces*

The Greeks adopted the symbols from the Babylonians and passed them on to the other ancient civilizations. The Egyptians assigned other names and symbols to the zodiacal divisions. The Chinese also adopted the 12-fold division, but called the signs rat, ox, tiger, hare, dragon etc.[13]

3.1.3 *Pisces - Mīna*

Pisces means fish. Sanskrit name is *'Mīna'* and *Matsya, Pruthuroma, Jhaṣa*[13] are the other names. Pisces is the twelth sign of zodiac, symbolized by two fishes which are bound together by a wavy band that swim in opposite directions. [vide fig. 12] Pisces is a

zodiacal constellation located along the ecliptic, the apparent annual path of the sun across the sky. According to astrologers, people whose birthdays occur between February 19 and March 20 are born under the sun sign of Pisces.[14] Its representation as two fish tied together is usually related to the Greek myth of Aphrodite and Eros, who jumped into the river to escape the monster Typhon and changed into fish, or, alternatively, the two fish that carried them to safety.[15]

Astrologers consider Pisceans to be sensitive, emotional, sunny, impressionable, dreamy, creative, psychic, and mystical. Typical Pisceans do not have great stamina. Pisceans can be delicate and vulnerable, especially when under emotional stress. Pisceans often lack the self-confidence necessary to reach their substantial potential.

Generally the men are stubborn, social, kind hearted. But women are stronger than the men. They are involved in society, less angry than men.[16]

3.2 *Āyurveda*

Āyurveda – A science of life, form of alternative medicine based on the principle that disease is occurred by imbalance of life forces. Since 5000 years, *Āyurveda* is the oldest existing system of medical practice and is regarded by proponents as acomplete way of life aimed at spiritual, mental and social well beings as well as physical health. [17]

In (Sanskrit) Indian literature, *Āyurveda* is also known as fifth Veda as it is knowledge of life because of which people can live

hundreds of years. According to *Dalhaṇa,* '*Āyurveda* is the science in which useful and unuseful things fee our life mentioned and diagnosis and medicines of diseases are explained very well.'[18]

आयुर्हिताहितं व्याधिर्निदानं शमनं तथा । विद्यते यत्र विद्वद्भिः स आयुर्वेद उच्यते ।। [19]

Āyurveda is the science, with the help of which people protect their life, the sages called that science as *Āyurveda* -

आयुषः वेदः इति **आयुर्वेदः** ।

Philosophy as a science and its aim reaches deeper and covers a more extensive field than more presentation of health and cure of illness. The aim of *Āyurveda* includes maintenance of this healthy state of balanced equilibrium restoration of same in case of any imbalance and derangement.[20] *Āyurveda* attempts to correct this imbalances of derangement by the application of spiritual and resources available to man.

From ancient *Vedic* age, the great sages created the *Āyurvedic* books in eight parts[21] such as surgery, treatment of diseases, medicines, toxicology etc. The purpose of *Āyurveda* is not only to cure illness but to preserve health and ensure a long, happy and useful life.

3.2.1 *Dhanvantarī*

The name of *Dhanvantarī* is known as doctor (*Vaidya)* of *Indra* or *Vaidya* in heaven. *Dhanvantarī* is the creator of the science of surgery and medicine,[22] appears in many passages in the *Vedas,* the *Purāṇas* and the classical Sanskrit literature where he is regards as a sage of divine origin[23].

ततो धन्वन्तरीदेवः श्वेताम्बरधरः स्वयम् । बिभ्रत् कमण्डलुं पूर्णममृतस्य समुत्थितः ॥

Atreyī, Bhāradwāja, Kaśyapa, are the main sages who created *Āyurveda* to protect the people from serious diseases. Afterwards, *Suśruta* [4th AD] *Caraka , Vāgbhaṭa* these are the famous freer their *Saṁhitās* and their specialty of *Āyurvedic* branches. The therapies of these scholars focus on lifestyle changes, herbal medicines, concentrating on diet, exercise, yoga, meditation, messages, herbal tonics, steam baths, and alternating medical practices.

3.2.2 References of Matsya

References of *Matsya* from the different *Āyurvedic Saṁhitās* summarized here. Types of fishes according to their habitat, various names of fishes, different species of fishes which are useful for many diseases as treatments, they are described in detail in *Āyurveda*. As the medical science prefers fish as a balanced diet today it was already to our ancestors and they preserve this knowledge in the form of *Saṁhitā.*

A] Types of Matsya – Matsyabheda

Āyurveda describes the fishes on the basis of their colour, shape, size, their habitat and their characteristic features of medicinal qualities. These fishes are divided mainly as *Nādeya Matsya*, (fresh water), *Samudra Matsya (*marine fish). Wherever there is distribution about the diet, the non-vegeterian diet separately discussed as '*Māṅsaprakarṇam or Mānsavarga. Śapharī , Rājira, Śakulim, Śṛṅgī, Vagusa, Śalya, Cullaka, Pāṭhīna, Culisa,*

Nandeyavarta, Mudfgara, Timī these are the fish species described in the *Dhanvantarī Nighaṇṭu.*[24]

1] *Nādeya Matsyas* - [fresh water fishes]

नादेया बृंहणा मत्स्या मुखोऽलिनाशनाः । [25]

These fishes found in rivers so called Nadeya Matsyas. These are big and healthy, careful to decrease the gases in the stomach.

2] Kaupa – [fishes in the well]

कौपा वृष्या कफाष्ठीलामूत्रकृच्छ्रविबन्धदाः ।

These fishes are found in the well. They are used to increase the fetility.

3] ***Tāḍāya*** – [fishes from the lakes]

ताडागा गुरवो वृष्याः शीतलाः बलमूत्रलाः ।

Fresh water lakes are habitats to these types of fishes. They are healthy and fertile. These fishes are used generally to increase sperms.

4] *Saroja* – [fishes in deep lakes]

सरोजा मधुरा स्निग्धा बल्या वातनिर्बहणाः ।

Fishes in the deep lakes are sweet in the taste, oily, strength- boosters and helpful to decrease the gas.

5] *Samudra* – [marine fish]

सामुद्रा गुरवो नाति पित्तला पवनापहाः । तत्रापि लवणाम्भोजाः ग्राहिणो दृष्टिनाशनाः ।।

The fishes found in seas and marine water. They are big in size and reach in mucus. They are useful to decrease the gases. Marine fish are very useful for eyes.

6] ***Hṛdodbhava*** – [fish in big lakes]

These types of fishes are found in fresh water of big lakes, so they are good strength boosters.

From the above discussion it is clear that fishes found in big and free habitat grow big in size and become healthy because of fresh water and they are also rich in nutritive values.
[vide Table 3.1]

B] Characteristic features of Matsya [medicinal uses of matsya]

In *Dhanvantarī Nighantu*, fishes are described with their characteristic features according to their colour, size and special feature which are helpful to identify the fishes for the particular of treatments.

1] *Rohita*

रोऽपरो रमुखो रोहितो मत्स्यपुंगवः ।[26]

Rohita is the best fishes in all fishes. It is red in color with red colored eyes and mouth. It is small carp mainly used in the treatments of paralysis. It is sweet and salty in taste.

2] ***Pāṭhīna***

सहस्रदंष्ट्रः पाठीनः कृष्णवर्णो महाशिराः ।[27]

Pāṭhīna type of fish has many teeth black in colour and having big head.

3] *Śapharī Proṣṭhṣṭī Cilicima* –

शफरी क्षुद्रमत्स्यः स्यात् प्रोष्ठी तु क्षुद्रमात्सिकाः । जलमीनच्चिलिचिमो मीनः ख्यातः समुद्रजः ॥

Śapharī is small carp, which Manu saw firstly in the river and protected it. *Proṣṭhṣṭī* is the tiny fish, while Cilicima is the marine fish occur in seas.

4] *Śṛṅgi, Ilsā*

Śṛṅgi type of fishes are oily, bitter in taste, light in weight and responsible for increasing the acidity. *Ilsā* fish is sweet, oily, tasty, light, useful tio reduce acidity and increase mucus.[28]

5] *Gargar, Warmi, Daṅḍamatsya*

गर्गरः पित्तलः किंचिद्वातजित्कफकोपनः, वर्मिमत्स्यो हरेद्वातं पित्तं रूचिकरो लघुः ।

दण्डमत्स्यो रसे तिक्तः पित्तरक्तं कफं हरेत्, वातसाधारणः प्रोक्ताः शुक्रलो बलवर्धनः ।।

Gargar type of fish is slightly reducing the gases. It increases the acidity and mucus. *Warmi* fish is the spiral fish, light in weight, tasty and it reduces the gases. *Daṇḍamatsya's* flesh is bitter in taste. It reduces the mucus and acidity. It increases gases, strengthness.

6] *Śiśumāra*

शिशुमारो गुरूवृष्यः कफकृद्वातनाशनः । वृंहणो बलदः स्निग्धस्तद्वन्मकरमादिशेत् ।।

This type of fish is big fish, oily, increasing mucus and sperms, strength- boosting. Dried fishes are strengthens, hard to digest and harmful for the formation of stool where as fried fishes are good in diet, healthy and fortifying.

According to seasonal habitat of fishes in *Āyurveda* they are considered as healthy and nutritive diet. For example in the autumn season fishes in the well are useful, in the lakes, in the spring fishes found in rivers are useful. In summer fishes in tanks are helpful as a good food. Fishes found in the streams are good in the winter season. The fishes found in rainy season are not useful as a food because they are responsible to increase all the diseases.[29] According

to season their nutritive values increase in corresponding habitat. During rainy season, river fishes are not used, the season may be as the river polluted or floods carry the fishes to change their habitat and their food may be not available in large quantity as it is in the other season. The change in the environment causes in the development of fishes according to their habitat. Water is very important to the fishes as their healthiness; nutritive values depend upon their fresh and marine habitats.

C] Concept of logic

Āyurveda is an ancient medical science which cures the people at the material level and neutral level. The aim *Āyurveda* is the attainment of the ultimate truth of salvation by which the human mind realizes the identity of the individual soul with the universal soul (the supreme consciousness) and can thus rise above unhappiness pain and martial destruction.

According to scholars of *Āyurveda, Āyurveda* is the special different science other than medical science, as the logic is the main concept of *Āyurveda*, which is applied to cure the patients. There are many methods of treatments but *Āyurveda* refers to these treatments according to the condition of patients and prescribes the medicines or therapies based on logics. For example there is description of edible and non-edible fishes according to the seasons, and their habitat is mainly concerned with the medicinal uses. These logics are helpful to *Vaidyas* to specify the plants, fleshes of animals and their recepies for the different types of diseases.

From the thousands of years, *Āyurveda* is still an important logical method used all over the world widely for realization of freshness of body as well as mind.

3.3 *References in Mahābhārata*

The great epic of one lack verses, composed by *Vedavyāsa* is *Mahābhārata.* The *Kurukṣetra* battle of 18 days in MBh has an importance because many warriors had shown their bravery in that battle. In MBh, there are many references found about Matsya as a Matsya kingdom and Matsya people.[30] This reference of *Matsyadeśa* in MB occurs in *Ādi, Sabhā, Udyoga, Virāta* and *Sauptikaparvas. Matsyas* [people of *Matsydeśa]* were one of the brave warriors amongst them who helped the *Pāṇḍavas* to fight against the *Kaurvas*. *Virāta* was their brave king and the capital of *Matsyadeśa* was *Virātanagar.*

According to *ŚB, Matsya* king is mentioned among the great ancient Indian monarchs who acquired renown by performing the horse-sacrifice.[31] The *Matsyas* are mentioned along with the *Usinaras, Kuru- Pāṇcalas, Kāsi-Videhas* and they are also connected with *Cedis and Śurasenas.*

Matsyas were brave warriors. They helped *Pāṇḍavas* in the *Kurukùetra* battle, where they occupied a prominent position because of the purity of their conduct and custom and through their bravery and prowess. *Matsyas* were brave and bold warriors. *Kośala, Chedi,* and *Śūrasena* were their neighborhood kingdoms.[32]

3.3.1 Geographical position of Matsyadeśa

Matsyadeśa was one of the main states *[mahājanpada]* amongst 16 great states. In *ajnātwās Pāṇḍavas* were hiding in the *Virātanagar* which was the capital of *Matsyadeśa.*[33] According to *Manusaṁhitā,* it was known as *Brahmadeśa. Aṅguttara Nikāya* of the *Pali Sutta Pitaka* mentions 16 *Mahājanpada* in *Jambudwīpa.* Here *Matsya* is referred to Maccha.[34]

In MBh, while describing the rivers and countries of India, *Saṅjaya* mentioned the *Matsyadeśa* near to *Kuśal, Cedi, Māla, Karuṣa* which are surrounded by mountains.[35] *Saṅjaya also* mentioned kingdoms which are situated outer side of the mountains; *Pratimatsya* is situated near to *kośala, Kuṅtala, Śurasenas, etc.*[36]

Matsyadeśa comprises the territory of **Alwar** with a portion of **Bharatapur.** *Matsyadeśa* is presently situated in the midst of a circular valley surrounded by low hare bed hills which are famous for their copper mines. It is 105 miles to south-west Delhi and 41 miles to the North Jaipur.[37]

Matsyadeśa, when independent seems to have had the monarchial constitution. It was probably annexed at one time by neighboring kingdom of *Cedi* and finally absorbed into the Magadhan Empire. According to RV, *Matsyadeśa* was near to *Indraprastha* and *Śurasena. [*vide the atlas of *Matsyadeśa,* in *Aśoka's* Empire*]*

Table 3.1 showing *Mastya* references from *Āyurvedic* books.

Sr. no.	*Ay. Book*	*Chapter*	*Verses no.*	*Types of Matsya*	*Modern Name*	*Physi. action of the flesh, Used as food*
1.	*Caraka saṁhitā*	*Ch-2 Vājikaraṇa*	*17-20 and 49*	*Rohu Śapharī*	*Carp*	*Used fish eggs as virilific*
2.	*Suśruta-saṁhitā* [22]	*Ch-46 1] Nādeyamat-sya Varga,*	*112-118*	*Gomatsya Kṛṣṇamats-ya [fresh water fish]*	*A huge sheat-fish A type of reddish, red-eyed fish*	*Construc tive, tonic, increases secretion of kapha; induces lactation*
3.		*2] Samudrama -tsya Varga*	*113*	*[marine fish] Candraka Gargaraka Kulisa Mahāmīna Nandivaral ak Nirālaka Pākmatsya Timi*	*silverfish Chanda Pi . Gagora Hatchet-fish Large marine fish Horn shark Not identified Sucking-fish Whale Whale shark*	
4.	*Vāgbhaṭa*	*Ch-6*	*51-52*	*Rohit/Rohu*	*Dolphin*	*Increases*

	saṁhitā Sārth - Vāgbhaṭa[23]	*Annaswar-ūpvijnān*		*Śapharī Timingila Cilicima*	*Spiral ûfish Whale Vegsa - fish*	*kapha,* Dolph-in's *flesh more useful,*
5.		*Ch -7 Annarak-ṣādhāya*	*30, 35-36*	*----same--*	*---same----*	*Avoided with milk, fish-fried oil mey be poisono-us*

References

[1] Astrology- The science, which deals with the study of the planets and human behavior is known as Astrology.

[2] Vettam Mani – *Purāṇic Ency*., Pp – 360-61

[3] Thompson Richard – The Cosmology of *Bhāgawata Purāṇa,* Motilal Banarasidas, 2008, p. 16

[4] vide *Pāṇinīya Śikṣa,*

[5] Joshi Jagannath – *Jyotiṣaśāstrapradīpa* – 1, p. 7

[6] vide www. Wikipedia.com /*Jyotiṣa*

[7] An article by Chaphekar Avinasha, published in the "Grahasanket" Diwali Magazine, 2008

[8] vide www.Wikipedia.com, / India / Indian Astronomy

[9] vide www.Wikipedia.com, / History of Indian Astronomy

[10] WBK vol.-1, p. 470, On. DVD – see the article " Stonehenge"

[11] Stonehenge - Why Stonehenge was built, is unknown, though it probably was constructed as a place of worship of some kind. Notions that it was built as a temple for Druids or Romans are unsound, because neither was in the area until long after Stonehenge was last constructed. In 1963 an American astronomer, Gerald Hawkins, purported that Stonehenge was a complicated computer for predicting lunar and solar eclipses. These speculations, however, have been severely criticized by most Stonehenge archaeologists.

[www.wikipedia.com]

[12] Govind Moghe - *Jyotirmayūkha* , Twelve zodiac, verses 17-18, p. 216

[13] NBK, vol.-1, article Astrology, p. 470

[14] Mi.St. 2008 / Astrology / pisces, see the table of signs of the zodiac.

[15] On. DVD 2008, vide the article Pisces.

[16] Sahastrabudhe Ramesh – An article about 12 zodiacs in the "Grahasanket" Diwali Magazine, 2008, Pp. 22-24

[17] *Suśrutasaṁhitā* - A Scientific Synopsis by Ray P., Gupta H. N., Roy M.

[18] हिताहितं सुखं दुःखमायुस्तस्य हिताहितम् । मानं च तच्च यत्रोक्तमायुर्वेदः स उच्यते ।।

Carakasaṁhitā - Susrutsthān, 1.15

[19] *Sārth Bhāvaprakāsa* – Pūrvakhaṅda, verse-3

[20] *Suśrutasaṁhitā - A scientific synopsis by P. Ray, H.N. Gupta, & M. Roy, p.1*

[21] 8 branches of *Āyurveda-*

1]*Salyataṇtra, 2] Śalākyatantra, 3] Kāyacikitsā, 4]Bhūtvidyā. 5] Kaumārbhrtya 6] Agadatantra, 7] Rasāyantantra* 8] *Vājikaranatantra*

[22] Vide intr. of *Sārtāh Bhāvaprakāsa.*

[23] Origin of *Dhanvantarī* – MB- *Āadiparva -16, BP - 8.8, AP - 3, VāP - Uttarākhand - 30, and BrP.- Upodhātapād 3.67*

[24] *Dhanvantarī Nighaṇṭu* – 165.383-85, p. 246

[25] For details vide *Dhanvantrī Nighaṇṭu – Suvarṇadivarga* – 390-92, p. 247

[26] ग्रोदरो ग्रमुखो ग्राक्षो ग्रपक्षतिः । कृष्णपुच्छो झषः श्रेष्ठो रोहितः कथितो बुधैः ।।

Sārth Bhāvaprakasa – Paṅcama Prakaraṇam, 99, p. 214

[27] ibid - *Sārth Bhāvapraakasa* – 104, p. 214

[28] ibid –_____ ,,_____, 106-107

[30] **मत्स्याः** कुशल्याः सौशल्याः कुन्तयः कान्तिकोसलाः । चेदिमत्स्यकरूषाश्च भोजाः सिन्धुपलिन्दकाः ।।४०।।

दुर्गालाः प्रतिमत्स्याश्च कुन्तलाः कोसलस्तथा । तीरग्रहाः शूरसेना ईजिकाः कन्यका गुणाः ।।५२।।

Bhīṣmaparva - 9.40

पांचालाः निहताः सर्वे द्रौपदेयाश्च सर्वशः । सोमका **मत्स्य**शेषाश्च सर्वे विनिहता मया ।।१५०।।

Sauptikaparva - 8.150

MBh - तथोत्तरां दिशं चापि परित्यज्य भयार्दिताः । **मत्स्याः** संन्यस्तपादाश्च दक्षिणां दिशमाश्रिताः ।।१४।।

Sabhāparva - 14.29

पाण्डवः सुमहावीर्यो बलो न बलिनां वरः । स काशिराजं समरा सुवाहुमनिवर्तिनम् ।। ६।।

वशे चक्रे महावाहुभीमो भीमपराक्रमः । ततः सुपार्श्वमभितस्तथा राजपतिं क्रयम् ।। ७।।

युध्यमानं वलात्संख्ये विजिग्ये पाण्डवर्षभः । ततो **मत्स्यान्** महातेजा मलदांश्च महावलान् ।। ८।।

अनघानभयांश्चैव पशुभूमिं च सर्वशः । निवृत्य च महावाहुर्मदधारं महीधरं ।। ९

Digvijayaparva - 30.6-9, 31.2-4, Virātaparva - 5.4

स शूरसेनान्कात्स्मर्येन पूर्वमेवाऽजयत्प्रभुः । **मत्स्यराजं** च कौरव्यो वशे चक्रे वलाद्वली ।।२।।

सुकुमारं वशे चक्रे सुमित्रं च नराधिपम् । तथैवाऽपर **मत्स्यांश्च** व्यजयत् पटच्चरान् ।।४।। *Digvijayaparva - 31.2,4*

[31] *SB - xiii 5.4-9*

[32] मत्स्याः कुशल्याः सौशल्याः कुन्तयः कान्तिकोसलाः । छोदिमत्स्यकरुषाश्च भोजाः सिन्धपुलिन्दकाः ।।

Bhīṣmaparva - 9.40

[33] *MBh - Virātparva, 1.1-12*

[34] *B. C. Law - Historical Geography of Ancient India, ch - Introduction, Pp. 42-43*

[35] *MBh - Bhīṣmaparva - Purvakhanda - Prathamkhanda - 9.40*

[36] *MBh - Bhīṣmaparva - Purvakhanda - Prathamkhanda - 9.52*

[37] *B. C. Law - Historical Geography of Ancient India, ch - Intr., p. 51*

[38] *On. DVD / Atlas of Aśoka's Empire*

CHAPTER – 4

FISH AND WHALE

4.1 Fish

Introduction-

The whole of the universe is covered by about ¾ of its surface by sea. Besides there are many extensive backwaters, rivers, canals, estuaries of fresh waters, natural lakes, tanks, ponds, pools, etc. all these waters are the abundant of aquatic animals and plants. Fishes are the most important part of these aquatic environments. The ancient Greek naturalists, especially Aristotle, were highly knowledgeable about many aspects of fish biology.[1] In the mid-20th century a great increase in interest in oceanography, together with new techniques and equipment for underwater observations (especially the self-contained underwater breathing apparatus, or SCUBA), opened many new avenues for the study of fish behavior and ecology under natural conditions. The development of improved methods of keeping fishes in tanks led to an increase in their use as laboratory animals in the fields of behavior, ecology, functional anatomy.

The particular branch of zoology which treats of the structure of the fishes, both external and internal, their mode of life, their distribution in space and time, etc., is known as ***Ichthyology***. The term fish is applied to a variety of vertebrates of several evolutionary

lines. It describes a life form rather than a taxonomic group. Fish share certain features with other vertebrates. These are gill slits, a notochord, a dorsal hollow nerve cord and a tail.

What is a fish?

A fish may be defined as a vertebrate adapted for a purely aquatic life, propelling and balancing itself by means of fins and obtaining oxygen from the water for breathing purposes by means of gills.[2] Certainly in number of individuals, and probably also in number of species, fishes are at the present time superior to mammals, birds, reptiles, or amphibians. There are 20,000 different species of fishes. Aristotle seems to have been familiar with only 115 species.[3]

Fish form the largest group of vertebrates, Pisces. This is bigger than all the other groups of vertebrates added together. The various kinds of fish differ so greatly in shape, color and size that it is hard to believe they all belong to the same group of animals. Nearly all fish are cold – blooded animals- mainly in fresh and marine water of seas, lakes, streams, ponds and rivers.

4.1.1 Evolution of fish

For as long as there have been people on the Earth, there have been questions about how and why life exists as it does. Scientists have shown that the idea known as evolution is the best explanation. They proved this idea by looking at fossils and by studying the way in which animals and plants adapt themselves to

change in their environments. Groups of plants and animals that share similar features are a kind of family, known as species.[4]

Young J. Z. states the simple definition of the evolution, " Evolution is the change in the genetic make-up of populations." [5] While **Author** explains it as the evolution is an established theory and not a mere hypothesis, the series of fossils excavated by the paleontologists should provide some evidence of this process.

Fish is considered as the ancestors of all other vertebrates. Before 500 million years ago, strange armored animals [Ostracoderms] swam in the world's sea which did not have jaws and fins but they did have backbones. So the fishes are known first vertebrates on the earth during the Devonian periods.

By the study of fossils, scientist show the changes in that occurred in the anatomy of fish down through the ages. The jawless fish [AGNATHA] were the dominant vertebrates during the Silurian and part of Devonian periods. [6] They flourished for about 80-100 million years. By the end of the Devonian period, nearly all jawless fish had become extinct.[7] These fish have round mouth parts that could be used for sucking or filter feeding. These rasping, sucking mouths are currently found on modern lampreys and hagfishes. These fish were often extremely armored in order to help them protect themselves. Most of these types of fish are currently extinct with the exceptions of the lampreys and the hagfish.

Fossilized imprints of the lobe-finned coelacanth (family Latimeriidae), some dated to 350 million years ago, are common. Because none are less than about 70 million years old, scientists previously considered the fish long extinct. In 1938, however, a

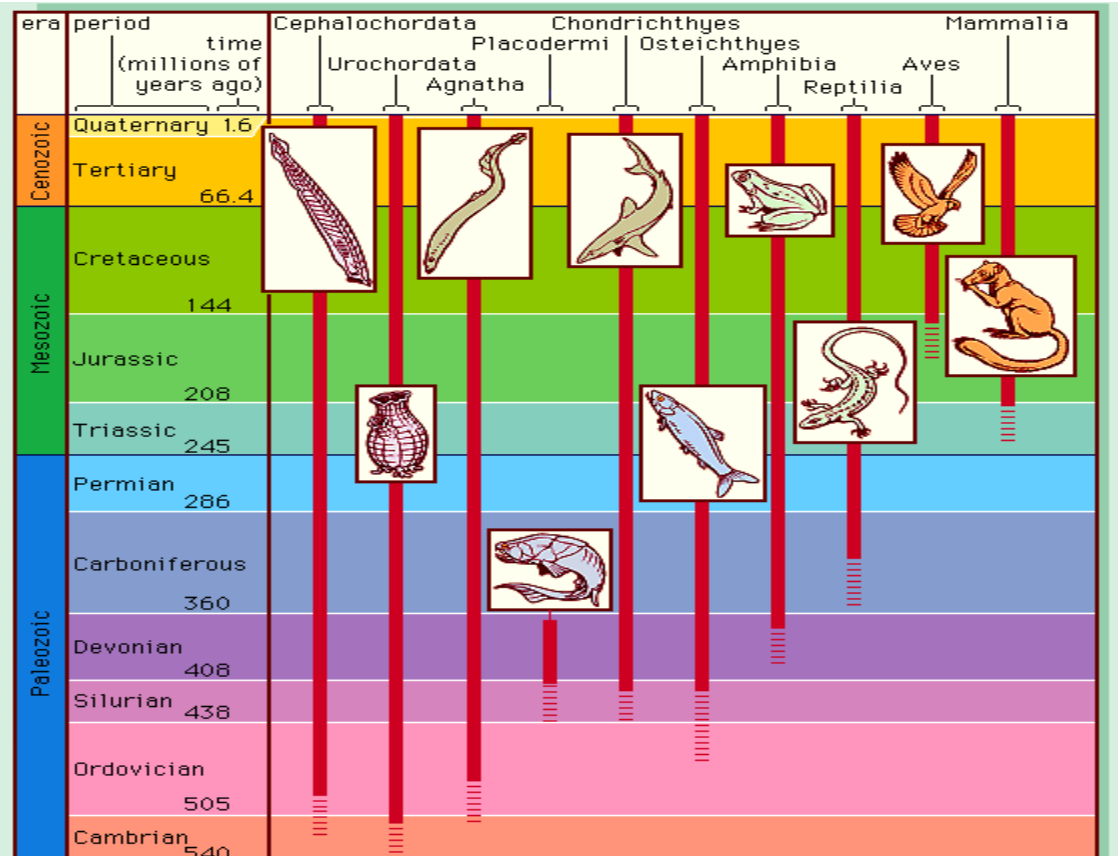
fishing trawler brought up a live specimen. Since then more than 100 living coelacanths, remarkably unchanged since the Cretaceous period, have been caught off the coast of South Africa.[8]

The early jawed fishes [GNATHOSTOMATAS] arose from the Agnathans in which the small terminal mouth was extended posterior. Placoderms are the earliest Gnathostomes and appeared during the Devonian and became extinct by the end of this period about 400 million years ago. But they dominated both salt and fresh water.

The cartilaginous fishes [Chondrichthyes] are very likely the descendants of some Placoderm ancestor and include sharks, rays. This class is commonly referred to as the cartilaginous fish because they lack true bones, instead they have cartilage and calcified cartilage for internal support. They are marine fishes and possess a cartilaginous skeleton which is probably a secondary feature. [vide table 4.1.1]

The bony fish, while being varied, all share an extremely important characteristic, a swim bladder. This probably evolved from lungs which had appeared in some freshwater species. The swim bladder is an internal structure which allows bony fish to float easily at any water level. In the middle Devonian, the bony fishes [Teleostomi] appeared with bony endoskeletons. They are divided into two main groups- modern and primitive bony fishes.[9]

Table 4.1.1 Evolution: chordate timeline[10]



This evolution of fishes, from Silurian to Devonian period, shows the development of features according to surrounding environment. These lung-fishes, with primitive paired limbs and lungs, probably developed into the early amphibians.

4.1.2 Habitat

Scientists have discovered more than 24000 species of the living fish. A fish can live anywhere where there is water. Generally they live in warm waters, icy waters of polar oceansountain streams, the deepest part of the ocean. Many fishes adapted to live in such unusual places as dark pools, streams of underground caves,

descent water holes and swamps. Even some species can live for months in moist mud.

Mainly the aquatic environment of fishes is classified into two major groups- salt water and fresh water environment. They cannot live in very salty water. Because of the high levels of the salt, the Dead Sea does not have any fish.[11] Some fishes can live only in salt water in the sea, for ex. Sharks, Parrot fish. Water temperature is one of the chief factors for the habitat of a fish. And as a matter of fact, the temperature of the blood in fishes investigated has always been at least half a degree above that of the surrounding water.[12]

Some fish live only in the fresh water [natural origins] i.e. in lakes, rivers and streams and in brooks, creeks, ponds, springs and swamps. Some live in streams which flow deep underground for ex. Catfish, minnows, carp. Still others [some sp. of fish] can live in either salty water or fresh water.[13] In India, basically the fish live in tropics. They have always economical and ecological significance. These fish are colorful, small in size.

The cold waters of the Arctic and Antarctic oceans have many kinds of fish than the tropical and temperate waters. The largest and fastest-swimming fish like swordfish, tuna, and variety of sharks, live near the surface of the open sea and are often found great distances from the shore.[14]

The upper 200 m (650 ft) of the ocean holds 78 percent of marine fish species. The warm, well-lit waters near coral reefs also promote a rich diversity of fish species. In freshwaters, the greatest diversity of fish species occurs in the warm tropics of South America,

Africa, and South East Asia. There are many species of tropical minnows, characins, and cichlids.

4.1.3 Adaptations

Adaptation of all organisms to the environment may be of great importance for the survival in the struggle of existence. Pr. Arthur Thomson defines the adaptation as "An adaptation is a special adjustment of structure or function to meet particular conditions of life,"[15] while Khanna S. S. says that it is the capability of animals to change themselves according to the changing environment.[16] An adaptation is furnished by the coloration of fishes. In the coastal region or in fresh water, we find many diverse forms living under the same conditions, with quite different shapes and structures.

A] Shape

The body is elongate in many forms and greatly shortened in others; the body is flattened in some (principally in bottom-dwelling fishes) and laterally compressed in many others; the fins may be elaborately extended, forming intricate shapes, or they may be reduced or even lost; and the positions of the mouth, eyes, nostrils, and gill openings vary widely.

Most fishes have a streamlined body. Fishes have no neck and so the head blends smoothly into the trunk which narrows into the tail. Fish have variety of shapes according to species for ex. Trout are shaped like a boat, Eels are like a snake. Sea-horses look like a horse standing on its tail. Rays are flattened from top to bottom. Anglerfish and Stonefish resemble rocks and the Pipefish look like long slender weeds.

B] Size

A size of fish varies according to species. The smallest fish known as goby, is smallest vertebrate in the world. It is only 12-14 mm. long, about half inch and has a name longer than itself, ***Mistichthys luzonensis.***[17]

Many of the brilliantly colored fishes that live among the coral reefs are only 3 to 4 inches long. The largest fishes are found among the Sharks and Rays. The largest fish is the whale shark which may grow more than 40 to 50 feet [12 meters] long and weigh up to 15 metric tons. But the Eagle-Rays are the most extraordinary monsters.

C] Fins

Fins are the main organs of locomotion in fishes for swimming and keeping its balance. These may be all round the body, from the back of the head, along the back [dorsal fin] to the tail [caudal fin], then along the lower edge [anal fin]. Fins are of two kinds- median or unpaired fins and paired fins. The median [unpaired] fins include a dorsal fin, anal fin and a caudal fin, while paired fins are the pectorals and pelvic corresponding to the fore limbs and hind limbs of the terrestrial vertebrates.

The modern bony fish have rayed fins. Some primitive bony fish have lobed fins which are less flexible than the rayed fins. Fins help to maintain the vertical balance when fish is resting or not swimming rapidly. The Sting-Ray uses its fins to fly rather than swim in the water. The pectorals are employed not only in flying or parachuting, but for padding, feeling the ground, holding on to

stones, keeping the water in motion over the eggs and even to go backwards.[19]

D] Locomotion

Swimming is the outstanding characteristic of a fish. Fishes are adapted for locomotion in water. Fish locomotion is closely correlated with the habitat and ecological environment. The body is spindle shaped, thicker in front then behind. The body is perfectly streamlined for movement through water. The slenderness of the body at the root of the tail is a sure sign of a good swimmer.

Young J. Z. explains about the faster moving types of fishes which have large caudal fins, a much smaller length of body relative to its depth and less flexibility. Mackerel sharks swim fastest with caudal fin which move side to side.[20]

Fishes swim in water mainly by three methods –

I. By body movements brought about by alternate expansion and contraction of the myomeres.
II. By movements of the fins.
III. Movements of caused by the action of jets of water expelled from the gill openings during the respiration.

Locomotion, only by means of fin movements, takes place when slow progress is desired, but for rapid swimming, body movement is most important. During such active swimming, the paired fins serve for balancing the body so that the fish remains in position, and does not float with belly upwards. The tail and caudal fin are the chief organs of locomotion in fishes. During swimming, the tail is lashed from side to side by alternate contraction and relaxation

of the muscles. By the rapid backstrokes and forward strokes alternately, the fish forces its way through the water.[21]

Many fishes swim as a series of wave like movements of the fin itself, for ex. Eel. Water expelled from the gill apertures during respiration, also helps in forward movement of the body. When fish is resting on the bottom, the pectoral fins are in constant motion to counteract the forward thrust produced by the respiratory current.

Other methods of locomotion, besides swimming, are jumping, burrowing, skipping, flying.[22] Thus, Salmon, Mugil, Cyprinus, sail-fish are able to take a leap out of water. Some species burrow into the mud, using their swimming movements. The mud-skipper uses its pectoral fins which are bent at an angle like an elbow joint, for jumping over the land. [IMAGE]. The climbing perch [Anabas] can even climb up the trees with the help of its pectorals and operculum.

E] Skin

The skin of a fish serves many functions. It aids in maintaining the osmotic [slow change in concentration] balance. It provides physical protection for the body. The skin is the sight of coloration, contains sensory receptors and in some fishes it functions in respiration. Skin has several other functions in fishes. It is well supplied with nerve endings and most probably receives tactile, thermal, and pain stimuli. Fish skin is well supplied with blood vessels. Some fishes breathe in part through the skin.

The inherent slipperiness of a fish's body is due to the presence of slimy mucus which is constantly being poured out in large quantities by special glands situated in the epidermis. It is thought that

the dermal [skin] bone first evolved in skin and only later invaded the cartilaginous areas of the fish's body, to provide additional support and protection.[23] That means the dermal bone has played an important part in fish evolution and has different characteristics in different groups of fishes.

F] Scales

Scales have played an important part in the evolution of fishes. Primitive fishes usually had thick bony scales in several layers of bone while modern fishes have scales of bone which allow much more freedom of motion in the body. [vide fig. 17]

Placoid - In Sharks and Rays, the skin is blown out into minute papillae or cones. The epidermis of the cone becomes hard like enamel by the deposition of chalk. These give rise to rough denticles or placoid scales, which represent the most primitive type of scale. Because of these spiny denticles the surface of the Shark's body is generally prickly to touch. These are modified into spines in Sting-Rays.

Ganoid or Cycloid - Bony fishes have similar denticles but as a rule, scales are formed as simple plates, known as ganoid in the inner layer of the skin, so denticle is not formed. As the plate grows it may form roughly four- sided scale [ganoid] fitting into each other, but in most of the bony fishes it is circular or oval [**cycloid** scale].[24]

The author tells the interesting information about the growth of the fish, "The scale is a definite, small portion of the total length of the fish ; if the fish in any one year grows, say, half its former length, the scale will show an annulus about half as broad as

the total of the earlier annuli. In some cases the scales are never developed or they may remain hidden in the skin, as in the Eels."[25] Since the scales grow with the fish, and the fish grows unequally at different seasons of the year, the markings on the scale have been used to determine the age of the fish. [vide pict 4.1.4] When the fish is growing rapidly, as in the spring and the summer, a large number of rings or annuli are laid down in the scale, but as the growth shows down in the winter, the annuli become fewer in number and closer together. These rings only represent the physiological condition of the fish.

G] Mouth and Jaws

The natural position of the mouth is in front but in many the jaws have pulled down and backwards and a snout has grown out above. Thus, in Sharks and Rays, mouth is ventral and drawn out sideways in a crescent.[26] The cyclostomes differ from all other fishes in having a rounded, funnel like mouth placed at the end of the head. Here the mouth acts as a sucker. It attaches itself to other fishes. A mouth, which is semicircular in outline and placed on the underside of the head, is characteristic of a large number of fishes habitually living in mountain streams or torrents.[27]

In the class of bony fishes, the primary and upper and lower jaws have become so much modified in the adult fish. In a typical bony fish, the mouth is placed at the end of the head, the upper and lower jaws are equal in length. In some, the mouth lies on the under side of the head as in Sharks.

In case of Sail-fish and Sword-fish, mouth is modified into a long snout. Sword-fish attacks on Herrings, Cuttle-fishes, and

Mackerel Shark with its sharp swings. It has often driven its sword into small boats and in large ships.[28] The Pipe-fish have no teeth, they manage to suck the small Crustaceans[29] in the water and even a large shrimp occasionally.

H] Coloration

Fishes exhibit an almost limitless range of colors. The color of most fish matches that of their surroundings. For example, most fish that live near the surface of the open sea have a blue black color, which matches the color of the surface.[30] Many fishes use bright colors for territorial advertisement or as recognition marks for other members of their own species. The coloration helps the fishes to hide from the enemies. Many fishes can change their color, by expansion and contraction of the pigment cells known as chromatophores. [Fig. 20]

The chromatophores lie beneath the epidermis in two layers. Among the chromatophores, there are a number of small grey plates. These are very opaque, and have a strong reflecting power; hence they are called as iridocytes. As the coloring matter may be red, yellow, or black, and perhaps blue; each cell is keeping to a particular color.

According to the way, the light is reflected from them they appear white or bright silver. They are composed of guanine, a waste product, which escapes from the body. Thus, in the Cod, the darker color of the back is due to the great abundance of chromatophores, which come under the influence of the rays of the light.[31]

Where the rays are more vivid, the coloration occurs more brilliant. This type of coloration is found in tropical and shallow water. In flat fishes and Rays, there is dead whiteness of the argenteum [homeopathic remedy] as there is no operation of rays. The blind-caves fishes like Amblyopsis and Lucifuga live in the dark , are colorless.[32]

I] Respiration

Respiration is produced by a current passing in a single direction. The area of respiratory surface is thus an important limiting factor in the movement and growth of fishes. If the water is at all deficient in oxygen the rate of breathing is naturally accelerated and the fish appears to respire hurriedly. Other factors which lead to an increased rate are the stress of some emotion such as greed or fear.

In many fishes, gill-chambers are the special modifications for respiration, where as in some fishes, air-bladders and lungs are the breathing organs. The principles of respiration are essentially the same in all fishes, but a marked difference in the type of gills is found in the three main classes. All breathing organs are closely associated with the upper part of the food channel or alimentary canal.[33]

The **author** explained the mechanism of respiration of fishes in detail. He described the phases of respiration. When a fish breaths, its initial movements consists of an expansion of the hoop like gill arches with a consequent enlargement of the cavity of the pharynx. At the same time the mouth is opened a little, and a stream of water is drawn into the pharynx, the external gill openings being kept tightly closed. This is known as the inspiratory phase. The

expiratory phase follows immediately and consists in closing the mouth tight, and at the same time contracting the pharynx, thus driving the water outwards over the gills and through the external openings. [34] The actual exchange of gases takes place as the water passes over the gills. It will be noticed that fish does not use the nostrils for breathing purposes.

Many fishes breathe air, especially those living in shallow, stagnant water in hot climates. Some that feed near the surface may also take gulps of air, but others can come onto the land when pools dry up. Some can burrow in the mud such as Catfishes.

J] Sensory organs

Like all vertebrates, fish have sense organs that tell them what is happening in their environment. The organs enable them to see, hear, smell, taste, and touch. In addition, all fish have a special sense organ called the lateral line system, which enables them to 'touch' objects at a distance.

1] Sight - The fish's eyes differ from those of land vertebrates in several ways. Most fish can see to the right and to the left at the same time. Because a fish has no neck and so cannot turn its head. Fishes living in brightly lighted shallow water will have relatively small but efficient eyes.[36] A few kinds of fish are born blind. They include certain species of Catfish that live in total darkness in the waters of caves and the Whale-fish, which lives in the ocean depth.[37]

2] Hearing - All fish can probably hear sounds produced in the water. Catfish have a keen sense of hearing. Fish have an inner ear enclosed in a chamber on each side of the head. Fish have no outer ears. In the fishes those hear well, there is a connection between the swim bladder and the ear. This may be either direct, by means of fine canals extending forwards or indirectly by a chain of vertebrae.[38]

3] Smell - The sense of smell is important in almost fish. It is highly developed in Catfish, Salmon and Sharks. The sense of smell is used to find out food and the sex members of the same species. The nasal organ of fish is located on the dorsal surface of the snout. The lining of the nasal organ has special sensory cells that perceive chemicals dissolved in the water. Odour also serves as an alarm system. Various species of freshwater Minnows react with alarm to the body fluids produced by an injured member of their own species.[39]

4] Taste - Most fish have taste buds in various parts of the mouth. Some species have them on other parts of the body. Catfish, Sturgeon and other fish have barbels near the mouth. They use the barbels both to see and to touch.[40]

5] Touch - Touch and the lateral line system are closely related. Many fish have a well-developed sense of touch. The lateral line system senses changes in the movement of the water.[41] It consists of mainly a series of tiny canals under the skin. A fish senses the flow of water around it as a series of vibrations. The vibrations enter the lateral line through pores and activate certain sensitive areas in the line. Changes in the pattern of vibrations may warn a fish of approaching danger.

Fish can also sense any changes in the pressure, salt content, or temperature of the water and so avoid swimming very far into unfavorable waters.

K] Special organs

Swim Bladder -

Most bony fish have a swim bladder below the back-bone. This swim bladder provides buoyancy [tendency to float], which enables the fish to remain at a particular depth in the water. In lungfish and a few other fish, the swim bladder serves as an air-breathing lung. Sharks and rays do not have a swim bladder. To keep buoyant, these fish must swim constantly.[42]

Electric Organs –

The deep sea fish have light-producing organs developed from parts of their skin or digestive tract. Some species use these organs to attract the prey or to communicate with others of their species. Some use these organs to kill their enemies or prey. [vide fig. 18]

In the Electric Cat-fish, the organ is situated between the skin and muscles. In the Electric Ray, two organs are present, lying on either side of the disc-like body, between the head and the greatly enlarged pectoral fins. [43]

Sound Production -

A large number of fish can produce sounds audible to our selves, and these noises are used for shoaling, to bring sexes together, or to warn off enemies. The **Drum-fish** [Pogonias] of the Eastern Atlantic produces loudest sounds. The 'whistling' and other noises of the **Maigre** [Sciaena] can easily be heard above the water and are supposed to be the origin of the song of Sirens.[44] The sound is often produced only by males but a large sac of the inner ear is found in both sexes.

4.1.4 Behaviour

Fish behavior is a complicated and varied subject. The nature of a response of an individual fish to stimuli from its environment depends upon the inherited characteristics of its nervous system and on the nature of the stimuli. As compared with the variety of human responses, however, that of a fish is stereotyped, not subject to much modification by "thought" or learning.

Fishes perceive the world around them by the usual senses of sight, smell, hearing, touch, and taste and by special lateral-line water-current detectors. In the few fishes that generate electric fields, a process that might be called electro location aids in perception. One or another of these senses often is emphasized at the expense of others depending upon the fish's other adaptations. In fishes with large eyes the sense of smell may be reduced; others, with small eyes, hunt and feed primarily by smell ex. some eels.

Specialized behavior is primarily concerned with the three most important activities in the fish's life: feeding, reproduction, and escape from enemies. Predatory fishes are most often solitary, lying in wait to dart suddenly after their prey.

Sleep in fishes, all of which lack true eyelids, consists of a seemingly listless state in which the fish maintains its balance but moves slowly. If attacked or disturbed, most can dart away. A few kinds of fishes lie on the bottom to sleep. Most catfishes, some loaches, and some eels and electric fishes are strictly nocturnal and retiring during the day to holes, thick vegetation, or other protective parts of the environment.

Communication between members of a species or between members of two or more species often is extremely important, especially in breeding behavior. Soundract at production is also one of the ways of communication. The sounds are used to attract the male or to make frightened the enemies.[35] The mode of communication may be visual, as between the small so-called cleaner fish and a large fish of a very different species. The larger fish often allows the cleaner to enter its mouth to remove gill parasites. The cleaner is recognized by its distinctive colour and actions and therefore is not eaten, even if the larger fish is normally a predator.

4.1.5 Feeding Habits

Plankton is collective term for a variety of marine and freshwater organisms that drift on or near the surface of the water. Their movement depends largely on tides, currents, and winds, because they are too small or weak to swim against the currents.

Most fishes are smaller than themselves. The smallest fishes eat these planktons. These planktons have very small life, such as one-celled protozoans. Plankton drifts with the currents in large numbers, flowing like a thick rich soup. Plankton is essential in supporting fish life since it is the main food of all small fishes who are the food of the bigger fish.

The largest sharks, such as whale sharks and basking sharks, feed on plankton by straining these tiny marine plants and animals from the water. [45] The zoo-plankton, comprises protozoa and small crustaceans, jellyfish, worms, and mollusks, together with the eggs and larvae of the many animal species inhabiting marine and fresh waters.

4.1.6 Economic importance of fish

Fish is found abundantly in all natural waters. It is a valuable source of food and has been used by man from ancient times. Fish cultivation on a large scale is gaining major significance in many lands. Tapping the wealth of the oceans and inland waters and its efficient utilization has become urgent for the survival of the human race.

India has a coast line of about 5,600 km and the continental shelf bordering the Indian coast has an area of about 2.6 million sq. km. in which infinite varieties of fish are found. In addition, the rivers, reservoirs, lakes, and canals in the country have an area of about 1.13

A] Fish as human food

Millions of human beings suffer due to hunger and malnutrition, and fishes form a rich source of food and provide a means to tide over the nutritional difficulties of man. Fishes have formed on important item of human diet from the time man appeared on earth and mainly caught for this purpose. A very large number of fresh water, brackish and marine fishes are caught by thousands of fishermen, all over the world and consumed [vide fig 19]

About 250 different species of fishes are used for edible purposes. Edible fishes are classified into two major categories based on their anatomical differences. They are finfish and shellfish. Edible shellfish are mainly salt water fish. Those fishes whose flesh is more watery and tasteless is on account of carnivorous habit and having enough small bones are not utilized as food.[46] In general, herbivorous fishes are more tasteful, that is why carps are preferred much as food. Although fresh water fishes are given preference over marine fishes for food, but marine fishes form the large supply of food of the world population.

The principal fresh water fishes consumed as food in India, are Major carps, Catfishes, Herrings, Feather backs, Live fishes, Mullets, Miscellaneous while the marine water fishes all types of shark, salmon, mackerel, Bombay duck, ribbon fish, pomfret, sole, tuna.[47]

B] Nutritive value of fish

Fish flesh is mainly composed of protein, fat, mineral and vitamins, with a high percentage of water. Fish is a very valuable source of protein which is easily digestible due to low percentage of

connective tissue. All the essential amino acids are present in fish flesh in sufficient quantities. It is also a rich source of iodine, phosphorus and vitamins B, A, D and B_{12} which is almost absent in plant food.[48] Fish therefore, a valuable diet.

Depending upon the fat content, the fish may be classified as :

1] Oily – Fat content more than 8%

2] Average fat – Fat content between 1-8%

3] Lean – Fat content less than 1%

Liver in fish is often the main site with the large deposition of fat. However the brain shows the highest concentration of fat and heart the lowest. Fish is a good source of minerals. Fish meat is a good source of copper, sulphur and phosphorous.[49] The principal minerals in fish are Ca, Mg, P, K, Na, Fe, Br, I and Cu. In general, salt water fishes contain more iron than freshwater fishes. Fish oils are the richest known sources of vitamins A and D.

C] Fish bye-products

A] Fish oil – The most important fishery by-product industry is that of the fish oil, which is of two kinds-liver oil and body oil. Fish liver oil acts as a vehicle for its soluble in vitamins A, D, E and K as well as a source of essential fatty acids. Cod liver oil is rich in fat but poor in vitamin A while Tuna is rich in vitamin A but poor in fat. The livers of Sharks generally have the highest contents of vitamin A and fat.[50] Fish body oil is obtained from entire body parts except liver. It is produced from non-edible fishes or the wastes, discarded during the processing. It is used in painting, varnishing, soap, candle, leather and steel industries. It is also used in oiling boat bottoms to protect the

decaying and rot.[51] Body oil is obtained from fishes, such as Sardine, Herring and Salmon.

B] Fish meal – It is prepared from the parts of fish not used for human food, as well as entire fishes that are not relished by man. The scrap is dried and ground in mill. This is called 'fish meal' and is used as artificial food for poultry, pig and cattle. The chief fishes that are used to prepare fish meal include Sardines, Mackerels, Sharks, Rays, Ribbon fish and Silver bellies. It is composed of proteins, 55-70; fat, 2-5; minerals, 10-12; and moisture, 6-12 per cent. Low grade fish meal is used as manure in plantation of tea, coffee and tobacco.[52]

] Fish manure – Fish that are unfit for human consumption are used to prepare fish manure for the fields. The dried fish is ground and converted to manure, which contains a high percentage of nitrogen and phosphate. When fish manure is mixed with soil, forms a rich fertilizer for plants.[53]

D] Fish glue and Isinglass – Fish glue is a sticky substance and is prepared from different wastes (bones, scales and fins) discarded during processing. It is used as an adhesive for papers, wood, leather and glass. The air bladder of fishes is used for preparing isinglass, which is a shining powder and is used for clearing wine, beer, making edible jelly and in the preparation of adhesive material.[54]

E] Fish leather — The skin of several fishes like the Sharks and Rays are used for making polishing and smoothing material. The dried and treated skin is also used for preparing ladies shoes, money bags, suitcases, belts.

D] Fishery and fishing

Fishery is harvesting of fish, shellfish, and sea mammals as a commercial enterprise, or season of commercial fishing. Fisheries range from small family operations relying on traditional fishing methods to large corporations using large fleets and the most advanced technology. Small-scale fishery is ordinarily conducted in waters relatively close to a home port, but factory ships that are equipped to process the catch on board often go thousands of miles from home.

Fish constitutes less than 1 percent of the world's diet, and the various hazards of the industry have effect on growth. Weather, environmental problems such as pollution, the unpredictability and high perish ability of the harvest, and the high costs of gear and equipment all discourage the expansion of the industry. Of the world's total sea harvest, about one-fourth is provided by the herring family (sardine, anchovy, menhaden). The cod family (haddock, hake, pollock, cusk, ocean perch) accounts for about one-sixth. Another one-tenth is made up of tuna, bonita, and mackerel; and the rest of the harvest includes salmon, flounder, halibut, sole, the shellfish, and trout and other freshwater fish, including carp and catfish.[55] Among the nations with the largest harvests are Peru, the United States, Russia, China, Japan, India, and South Korea.

E] Fishing

Fishing is one of the oldest employments of humankind. Ancient heaps of discarded mollusk shells, some from prehistoric times, have been found in coastal areas throughout the world [vide graph 4.1.6B]. Archaeological evidence shows that humans next learned to catch fishes in traps and nets. These ventures were limited at first to the lakes and rivers, but as boats and fishing devices were improved, humans ventured into sheltered coastal areas and river mouths and eventually farther out onto the continental shelves.

Fishing technology continued to develop throughout history, employing improved and larger ships, more sophisticated fishing equipment, and various food preservation methods. Commercial fishing is now carried on in all types of waters, in all parts of the world. Commercial fishing can be done in a simple manner with small vessels, little technical equipment, as in small local or traditional fisheries. It can also be done on a large scale with powerful deep. sea vessels and sophisticated mechanical equipment similar to that of modern industrial enterprises.

F] Aquarium

Aquarium is a water-filled tank, usually with glass slides, in which aquatic plants and animals, particularly fish, are kept. These are used for decorative effects, exhibitions, and scientific study of the aquatic life.

Home aquariums are often made to stimulate a natural environment. Aquatic plants supply the oxygen needed by the fish, but an aerating device is used for additional oxygen. The best water for fish is water in which they have already lived. The best minerals for use in aquariums are quartz, sandstone and granite.[56] Generally ornamental fishes such as goldfish, minnows, catfishes, carps, angelfish, suckers, cichlid, angelfish, gourami, killifish, guppy, paradise, betta, etc. are mostly selected by the people.

Large aquariums often called as oceanariums or seaquariums, such as the Atlantis Aquarium on Paradise Island and Miami seaquarium, provide an opportunity for scientists and the general public to observe marine and aquatic animals. Like modern zoos, modern aquariums strive to provide naturalistic enclosures that simulate the wild habitats of the animals in their care. They also undertake public education campaigns to publicize the effects of pollution on marine and aquatic organisms, and they garner support for conservation efforts worldwide.[57]

Fishes are helpful for keeping the number of organisms on the earth in balance. Fish food on some aquatic organisms and themselves become food for others. This process is known as 'food chain'. Fish are part of many food chains. Certain fish eat planktons and are in turn eaten by other fish. These fish may then be eaten by people or by birds or other animals. [58] The decayed matter of died fishes provides nourishment for water plants and animals. In this way, fish plays important role to balance the aquatic ecosystem as well as environment. [vide fig.20]

People may upset the balance by catching too many fish of a particular kind. The pollution of water effect so badly that certain kinds of plants and animals can live in it. This water pollution causes the depletion of fish population by adverse changes in the physical, chemical and biological properties of fresh water.

4.2 Whale

The term Whale can be used for reference to any of aquatic mammals that belong to the order *Cetacea.* The name '*Cetaceans*' comes from a Latin word meaning large sea animal. Any member of entire aquatic group is commonly known as *Whales, Dolphins* and *Porpoise.* The ancient Greeks recognized that *Cetaceans* breathe air, give birth to young, produce milk and have hair – all features of mammals.[59] They belong to the group of animals called marine animals and live their entire life in the water. Scientists have identified 79 species of *Cetaceans*.

Whales are mammals as are humans, dogs, cats, elephants. This means that they are not fish. They breathe air and so must return to the surface at regular intervals to get a breath. They give birth to live young that stay with the mother for over a year and feed on milk produced by the mother. Whale is a large sea-animal that looks like a fish but in fact not a fish. Whales are the heaviest known animals reaching a maximum size in the Blue Whale which is perhaps more than 30 meters in length 200 metric tons in weight.

Whales have a fishlike streamline body; their tail fins called flukes are horizontal rather than vertical. Whales are warm-blooded and have a skeleton similar to our own. They have paddle like fore limbs, called flippers and have similar bones in them to our arms and hands. The hind limbs are generally not present at all. Their skin is smooth and glossy and, depending upon the species may be black, white, or a variety of colours. Whales resemble fish in many

ways, but they are not fish. They differ from fish in many aspects.[vide table 4.2.1] By the end of 20th century, Cetacean's economic importance was due to whale watching, a tourist activity and major source of income for certain regions of many countries.

	WHALES	FISH
Breathing	breathe air through blowholes	breathe water through gills
Swimming	flukes (tail) move up and down	tail moves left and right
Skin	hair (not very much, though)	scales
Young	live-born young	most fish lay eggs
	nurse, protect, and teach their young	none, usually
Thermal regulation	warm-blooded	cold-blooded

Table 4.2.1 Difference in between Fish and Whales [60]

4.2.1 Origin of whales

No one knows exactly when the first whale swam the oceans of world how those whales looked like. Although the history of the very first whale ancestor is still unknown, that creature definitely came from the land. Scientists know that the first mammals developed on land and whales still show signs of their relationship to

land mammals. However, the fossil remains of some early whales that are 50 million years old have been found.[61] Scientists called these whales **Archaeocete** or ancient whales. Aechaeocetes lived for 25 million years [Oligocene Epoch] and then disappeared—no one knows why. They left no descendants.[62]

Whale Fossils- From the fossil record **Archaeocete** is ancestral to living whales [Cetaceans]. Recent work with whale fossils indicates that the anklebones of whale ancestors resembled those of archaeocetes. Some archaeocetes measured 20 meters long, and they were clearly sea creatures. In skull and teeth structure, however, they were like early land mammals. In appearance they were not different from the toothed and baleen whales.

In 1976, a whale fossil found, which was the remains of a baleen whale entombed vertically in a diatomaceous earth theory and only the head and a small part of the body were visible. This fossil whale may be close to 80 feet long indicating the modern baleen whale having a head of similar size. Two skeletons of whales are found in bogs covering glacial deposits in Michigan and bones, skeleton of another whale were discovered in Vermont, more than 500 feet above sea level.[63a] A fossil whale known as **Basilosaurus** found before 42 million years and represents the stage of whale evolution in which hind limbs are very small but still visible.[63b] Modern whales, which first appeared in the fossil record 5 to 10 million years ago, have no visible hind limbs, but some whale species have tiny pelvic and leg bones embedded in muscles.

The Miocene was the epoch during which modern ocean circulation began and regional areas increased and developed. This

resulted in setting the stage of evolution of large whales with seasonal migrations. At the same time, the modern toothed whales began to emerge, and developed into 9 families. Four of these have since become extinct. The first baleen whale had wide, flat skulls bordered by a reduced number of teeth. By the middle Miocene Epoch, there were several families of baleen whales including the right whales and rorquals.

4.2.2 Types of whales

The most common way of classifying whale is according to how they feed. The Odontoceti, or toothed whales, use teeth and Mysticeti or baleen whales, use horny, fringed plates called as baleen. Scientists classify whales into two groups- toothed whales and baleen whales.

A] Toothed whales

They have jaws lined with pointed teeth [vide fig. 21]. Some have teeth in the front of lower jaw or in both jaws. Some have teeth that are embedded in the jaw's gums. These teeth are not exposed and do not help the whale feed on prey. Toothed whales use their pointed teeth in hunting fish, squid, and other prey.

There are about 65 kinds of toothed whales.[64] They differ in size, in shape and in the number of teeth they have. Scientist divided these kinds of whales into 5 groups – 1] Sperm whales, 2] Beaked whales, 3] Narwhales, 4] Belugas, 5] Dolphins and Porpoises.

1] Sperm whales -- They have a very large head and large teeth. They are deep divers and eat squid, fish, octopus, eels. Sperm whales have a huge, square-shaped head [vide fig. 24] The

lower jaw is narrow and has from 16 to 30 teeth on each side. Mature males may grow to about 18 m (about 59 ft) in length and weigh up to 55 metric tons, while females are smaller, growing to 12 m (39 ft). All Sperm Whales live only in tropical and temperate waters. Some whales have been observed to stay underwater for close to two hours. Sperm whales can dive to depths of 1,000 to 2,000 m (3,300 to 6,600 ft).[65] Water at these depths is in complete darkness, and these whales probably locate their prey using echolocation. Sperm whales specialize in feeding on large deep sea squid. A pigmy Sperm Whale grows only about 3.7 meters long. The Sperm Whale is an endangered species.

2] Beaked whales -- Beaked whales are small to medium-sized whales with long, pointed snouts and, in males, two to four protruding teeth on the lower jaw. Some of them grow only about 5 meters long, and others reach 12 meters. Beaked whales are deep divers and may remain below water for 30 minutes or longer. They have been sighted in polar, temperate, and tropical oceans and feed mainly on squid and fish. [vide fig. 25]

3] Narwhals -- The narwhal is typically about 4.7 m (15 ft) long and weighs about 1 metric ton. Narwhals have only two teeth. In females the teeth usually remain embedded in the gums. In males the right tooth remains embedded, but the left tooth commonly grows out into a spiraling ivory tusk that grows up to 3 m (10 ft) long, straight forward from its head [vide fig. 26]. Scientists believe that males use this tusk in fights against rival males. They are native to the cool waters of the Arctic and North Atlantic oceans where they live year-round. When

narwhals surface after a dive, escaping air from the blowhole makes a shrill whistle.

4] Belugas -- Also called "canaries of the sea" because of their loud, shrill squeaks and chirps. Beluga whales live in the upper parts of the northern hemisphere, in coastal marine estuaries and near pack ice. Belugas are popular attractions in public aquariums and oceanariums because of their playful and "talkative" behavior [vide fig 23].

Belugas are black or brown in color at birth, and then lighten with age until about age five, when they become milky white. Belugas grow to a length of 7 m (23 ft) and weigh from 700 to 1,600 kg (1,500 to 3,500 lb). The upper jaw contains 20 teeth and the lower jaw contains 16 teeth. The beluga lives year-round in Arctic waters, traveling in groups ranging from five to ten individuals up to a thousand or more. They communicate with a series of whistles, squeaks, bell-like sounds, and clicking noises. They eat mostly squid and fish.

5] Dolphins and poropoises -- Dolphins live in all oceans and grow about 2 to 9 meters long. Porpoises grow 1.2 to 1.8 meters long. They have a streamlined body that is well adapted for life underwater. Their paddle-shaped flippers steer and provide balance. Their broad horizontal tail flukes propel them through the water. Dolphins lack structures such as hind limbs, hair, or external ears. River Dolphins do not live in the sea. They live in the muddy waters of the Amazon in South America and Ganges in India. They grow about 2.5 meters long and have a long beak [vide fig. 27]

B] Baleen Whales --

Baleen whales are named for the long, horny plates of baleen, also known as 'Whalebone', that are attached to the roof of the mouth instead of teeth. Baleen consists of the same material as human finger nails. Baleen hangs from the whale's upper jaw. A whale uses these plates to sieve out the food from the water [vide fig. 21]. They feed mainly on Plankton. There are 10 species of Baleen Whales that range in size from 2 to 30 meters.

1] Right whales -- Scientists recognize three types of right whales: northern, southern, and bowhead, also known as the Greenland right whale [vide fig. 28]. Right whales were so named by early whalers, who considered them the "right" whale to hunt because they swam slowly at 5 to 10 km/h, floated in the water when dead, and were excellent sources of valuable oil and baleen. Right whales are thick solid bodies and lack a dorsal fin. They may reach 18 m (59 ft) in length and weigh up to 70 metric tons. Right whales have long, thin streamers of baleen for catching small prey. They swim slowly forward with open mouths continuously. Water flows through the baleen, and the plankton becomes entangled.

2] Gray whales -- Gray whales are slate-colored and measure up to 15 m (49 ft) in length. Gray whales are slow swimmers that stay near shallow waters where they can feed. They feed primarily on plankton, small fish and amphipods. Gray whales live along the coast of North America from the Arctic Ocean to Baja California, Mexico [vide fig. 29]. They migrate annually between summer feeding grounds in the

Bering Sea and winter calving and breeding lagoons on the Pacific Coast of Baja, a round trip of some 19,000 km (12,000 mi).

3] Rorquals - Rorquals comprise the blue, fin, humpback, Bryde's, sei, and minke whales. These whales are characterized by pleated throat grooves, while eating these throat grooves expand, enabling the whale to swallow up to 70 metric tons of water. Rorquals typically have narrow, streamlined bodies and they are the fastest swimming baleen whales—the Sei whale, for instance, can swim more than 40 km/h (25 mph) over short distances [vide fig. 30].

The **Blue whale** is the largest living animal on Earth, some reaching a length of nearly 24 m (80 ft) and a weight of 150 metric tons. As its name suggests, the blue whale is blue-gray in color. The blue whale makes the loudest sound of any animal—over 150 decibels [10 to 19Hz].[66] This sound, which is louder than the noise of a jet aircraft taking off, can travel over thousands of kilometers underwater. Blue whales have been protected from commercial hunting since 1966, but they remain rare. They are most commonly observed in the northeast Pacific and northwest Atlantic oceans.

The **Fin whale** is the second largest animal after the blue whale. It can grow to 24 m (78 ft) in length and weigh up to 70 metric tons. The fin whale has a gray back and white undersides. It swims at speeds of 48 km/hr.[67] Fin whales are most common in the Southern Hemisphere, while smaller populations inhabit the North Atlantic and North Pacific. Some eat krill, and some eat anchovies, herring, and other small fish.

The **Humpback whale** averages about 12 m (40 ft) in length and 30 metric tons in weight. It is black with varying amounts of white on the sides and belly. The humpback's long flippers may be one-third the length of its stocky body [vide fig. 32]. Groups of several humpback whales have been observed cooperating to trap schools of small fish. They live in all oceans and often swim in coastal waters. They communicate by means of complex songs which can be detected at a range of over 170 kilometers. The songs are made up of a series of sounds.

Bryde's whales are the only baleen whales that spend their entire lives in warm or tropical waters. They can be found in both inshore and offshore waters of South Africa, Japan, Sri Lanka, Fiji, and Western Australia. Bryde's whales have a pale gray, slender body that grows up to 14 m (46 ft) in length and weighs up to 24 metric tons.

Sei whales are usually about 14 m (46 ft) long and weigh less than 20 metric tons. They are dark blue-gray or black with some white on the undersides. Sei whales are the only baleen whales that feed on krill both by skimming and gulping. They live throughout oceans of the world most common around Antartica.

The **Minke whale** is one of the smallest of the rorqual whales, growing up to 10 m (33 ft) in length and 10 metric tons in weight. Minke whales are gray-blue, with white bands across the flippers. They have a pointed head that appears V-shaped when

viewed from above. They found in waters around the world, and seem to prefer inshore waters.

4.2.3 Habitat

Cetaceans are found throughout the world's oceans, from the Equator to the Polar ice. The largest populations of whales existed in the oceans around Antarctica. The abundance of cetaceans is this hard to estimate accurately, but whale population is varied over the years, depending upon the human activities. Some whales like the blue, fin, humpback and gray, undertake the longest migrations in the animal kingdom. They travel thousands of kilometers between the tropics in water and sub polar waters in summer. **Indian Ocean whales.** From the unusual pygmy blue whales off the West coast of Sri Lanka, to the humpback whales off the South Coast of Oman, the Indian Ocean is an important area for cetaceans, large and small.

Cetaceans are distributed in all the world's oceans from the far polar reaches to the Equator. They concentrate in areas where there is an abundant supply of food. Some species are coastal and some are found in open sea, dwelling farther offshore. Some river dolphins are found in the Amazon, Orinoco, La Plata, Yangtze, Ganges, and Indus rivers and surrounding drainage waters.[68]

4.2.4 General features

A] Body surface, shape and size

Whales have a smooth highly streamlined body shape, which enables them with a minimum of resistance. A whale propels itself by moving its flukes [tail fins] up and down. The absence of hind legs distinguishes the whale from most other animals. The compressed neck vertebrae joined together into one bone which keeps the head from moving about as a whale swims.[69]

A common chordate of mammals that is the hair covering is reduced in cetaceans, because hair is a poor insulator which is not helpful during swimming. A few bristles on the head are all the hair that whales have. Various organisms live on or in the skin of whales which affects the appearance of them, for example yellow algae live on the lower body surface of Blue Whale and the variety of whitish organisms live on bodies of Gray Whales and Right Whales.[70]

Whales are enormous in size compared to all other animals. Living in water enables them to reach enormous sizes. The buoyancy of water helps to support a whale's body and makes it possible for whales to grow far larger than any land animal. The scientist of Maltese Islands, Vella Adriana comments about the variety in shape and size. It is wide, ranging from tiny Dolphins just over 1meter in length to the Blue Whale, which is typically 25 meters long and 100 tons in weight.[71]

B] Sense Organs

The eyes of most whales are well adapted for life underwater. Strong muscles surrounding each eye change the shape of

the eye's lens. This enables whales to focus their vision both underwater and above water. When the animal dives to great depths, the tear ducts shed oily tears that enhance underwater vision and protect the eyes from the effects of salt water. Toothed Whales have no sense of smell but Baleen Whales have a poor sense of smell. Some kinds of Toothed whales may have a limited sense of taste, but most whales cannot taste. Dolphins can differentiate between sweet, sour, bitter and salty.

All whales have well-developed senses of touch and hearing. They can hear an extremely wide range of sounds, including low and high pitched sounds far beyond the range of human hearing. Unlike people, whales can tell from what direction a sound is coming underwater. From the echoes, whales determine the distance to an object and the direction in which it lies.

C] Skin and blubber

Whales have smooth, rubbery skin that slips easily through the water. It feels much like wet rubber to the touch. The skin has no sweat glands or oil glands. Beneath the skin, Whales have a layer of fat known as blubber, sometimes as thick as 50 centimeters [Right Whale] which keeps them warm [vide fig. 22]. If food is scarce, whales can live off their blubber for a long time. Blubber is lighter than water and so it also increases the buoyancy [tendency to float] of whales. It helps to preserve body heat and permits whales to stay warm even in near-freezing waters.[72] Whales have been heavily hunted for their blubber, which, when processed into oil, can be

burned in lamps and used in paints, soaps, cosmetics, and other products.

4.2.5 Respiration

As all mammals, including humans, they breathe air, Whales have lungs for respiration; they must come to surface regularly to breathe. When a whale comes up to breath, it rolls forward as it breaks the surface. This movement gives the whale only two seconds to blow out and breathe in up to 2000 liters of air. Whales breathe through the nostrils, called blowholes, located on the top of the head.[73]

When whale exhales, it produces a cloud called a blow or spout. The blow is visible because of water condensation and mucus particles. Blows of blue whales are more frequently more than 6 meters [20 feet] high [vide fig. 31] Baleen whales usually breathe every 5 to 15 minutes but they can go as long as 40 minutes without breathing. A sperm whale can hold it's breathe for up to 2 hours.[74] Whale lungs exchange 90% of their contents with each breathe while human lungs exchange about 15 to 20% with each breathe. This means whales can take up oxygen and dispose of carbon dioxide much faster than humans and so they can hold their breath underwater for long periods. When a Cetacean loses consciousness, it does not breathe and quickly dies because breathing is not in reflex in Cetaceans as it is in terrestrial mammal.[75]

4.2.6 Locomotion - swimming and diving

As the whales evolved from four legged terrestrials animals, forelimbs are developed into finlike flippers which are the main locomotive adaptations in the water. Whales swim by making powerful up and down movements of the tail flukes, which provide thrust. Flippers help to steer, while the back muscles, which are very large, drive the tail to propel the animal. Like fish, almost all whales possess a dorsal fin that serves as a keel. Whales use vertical strokes when they swim, instead of horizontal strokes like a fish. Most whales remain near the surface of the ocean, [vide fig. 25 and 28] but some dive to great depths and remain underwater for long periods [50-80 minutes].

Whales possess interesting adaptation for diving. During a dive, the whale's heart rate slows to as low as 3 to 5 beats per minute. This conserves oxygen and maintains blood pressure in the brain and heart. The longest recorded dive is that of a harpooned Bottlenose Whale that dived for two hours, surfaced, and dived again. The swimming speed of a whale is about 2 meters per second [near about 7 km or 4 miles per hour].[76] According to species speeds vary greatly. Fin and Blue Whales can swim as fast as a boat must travel in excess of 30km/hr to catch up them. Sonar* records indicate that Fin Whales can sprint at 48km/hr. Right, Humpback, and Gray Whales can swim faster than 9km/hr. Sperm Whales can swim up to 36km/hr. The fastest Cetacean appears to be the Sei Whale, recorded moving at speeds up to 65km/hr along the ocean surface.

4.2.7 Reproduction

Whale breeding is seasonal usually in the winter. Most large species migrate to the tropics to mate and give birth. During the courting, the whales may stroke each other with their flippers. Humpbacks sometimes hold each other with their long, curved flippers. Generally male Humpbacks produce sounds or songs during mating. The pregnancy period in mast whales lasts 10 to 12 months but Sperm Whale carries her baby 16 months.[77]

Whales give birth to a single baby, called a calf. They give birth tail first, opposite of other mammals. Baby whales are already giant animals at birth, they are long as much as a third of the length of the mother at birth [vide fig. 32].[17] For ex. Newborn Blue Whale is average about 3 tons in weight and 7 meters in length. It grows an average of 0.3 meter per week and gains weight at a rate of 90 kg per day. The mother produces milk richer in fat, proteins and minerals than the milk of land mammals. This reach food helps the calves grow amazingly fast. The largest whales can produce an estimated 600 liters [160 gallons] of milk per day.[78] Newborn whales nursed by mothers up to a year before beginning to feed in their own. Whales may live from 20 to 60 years. Larger species live longest.

Whales live in groups called herbs, pods, or schools. Pilot Whales and many species of Dolphins swim in herds of 100 to 1000. Most adult Killer Whales live in pods with their offspring. Toothed Whales appear to be more socially organized than Baleen Whales. Modern techniques have determined some Fin Whales to be 100 years old, some Humpbacks 96 years old and some Blue Whales

90 years old. But the largest lived whale is a Right Whale that can survives for more than 200 years.[79]

4.2.8 Migration

Migration is regular occurrence in many whale species. As a rule, large whales have north and south seasonal migrations, spending summers in high latitudes near the poles, where there is an abundant food supply, and moving toward the Equator in the winter for breeding. The warm waters provide a comfortable environment for babies. Most kinds of Baleen Whales migrate between polar and tropical regions. One of the greatest migrations is undertaken by the California population of the Gray Whale which travels in summer in the seas of the Arctic and in winter in lagoons off the coast of Baja California—a journey of 5,000 km (about 3,000 miles) each way.[80]

Migratory whales usually do not cross the Equator, and that has led to the development of genetically separate populations in the north and South ocean basins. Depending upon the species, sex, age, and season, whales may travel alone, in pairs, or in small or large groups. However, one humpback whale was photographically identified near the Antarctic Peninsula and was later sighted on the coast of Colombia, having covered at least 8,334 km in both the South Atlantic and North Atlantic ocean basins. Two kinds of Baleen Whales and most species of Toothed Whales do not migrate while Bowhead Whales never leave the Arctic. Belugas and Narwhales stay in Arctic waters.[81]

4.2.9 Behaviour

Studies of whales in captivity have taught scientists much about the complex social behavior of whales. Since the late 1980s, the advance uses of satellite tracking systems have broadened opportunities for scientists to observe how whales behave in the wild. Here some special behaviors are discussed from the researches of scientists.

A] Intelligence

Scientists believe that whales are intelligent animals. Some scientists equate brain size with intelligence, reasoning that whales should have the capacity for intelligence because they have relatively large brains. The human brains averages about 1.2 kg, the bottlenose dolphin brain about 1.8 kg. The largest brain of a sperm whale is recorded about 9.2 kg.[82]

Some whales in captivity exhibit extensive learning and problem-solving skills. Dolphin curiosity and their often eager interactions with humans also suggest a high level of intelligence. The most interesting indication of whale intelligence came with the discovery in the 1970s of whale singing, most especially in Humpbacks. Humpback songs may last more than 20 minutes. All the singing whales of a particular migrating group sing the same song. Singing most occurs in winter mating grounds. Scientists have also observed killer whales teaching their young cultural practices and adults in the pods teaching the young how to attack these sea lions. Studies that presented individual Dolphins with mirrors and video images found that the Dolphins could recognize themselves and also distinguish themselves from other Dolphins.[83]

The scientist, Vella Adriana has a detail study of Cetaceans found in Maltese Islands. He stated that Cetaceans rapidly learn tasks. They are playful and appear to have a sense of humour. They show to be able to learn

B] Sound Production and Communication

Because of the restricted utility of vision underwater, whales use sound to perceive and interpret their environment and to communicate, sometimes over vast distances. All Cetaceans produce sounds and use the larynx* for this purpose. Whales may use sound to attract mates, repel rivals, communicate within a social group or between groups, navigate, or find food. Their sounds can be divided into communication signals and echolocation# signals. Echolocation has been recognized in Toothed Whales but not in Baleen Whales. Toothed Whales use extremely high frequencies, on order of 150 kilohertz, for refining spatial resolution from their echoes. Baleen Whales generate their sounds at frequencies that are audible to humans or below that range. Biologists have computed that the 10-hertz sounds of Fin Whales, for can travel over 1,800 km (1,100 miles).[84]

The songs of Humpback Whales, which can go on for as long as 25 to 35 minutes and repeat for up to 24 hours.[85] The scientists from BRP studied the distribution and behavior of whales and recorded the sounds of different species of whales. They said, "Beginning in 1993, using acoustic data from IUSS, we have studied the seasonal and geographic patterns of vocal activity for blue, fin, humpback, and minke whales from large portions of the western

North Atlantic (east of the Canadian maritime provinces and the US eastern seaboard) and eastern North Atlantic (west of Britain and Ireland)." [86]

c] Breaching

Although the exact reason for whale breaching is unknown, this activity is believed to provide one mode of communication among whales. Adult whales are often observed breaching together, especially when different whale pods, or groups, encounter one another. Scientists are unsure why whales breach. Some theorize that this behavior may be a display of dominance used in courtship or may enable the whales to view their surrounding area. The loud sound that breaching makes as the whale lands in the water suggests to some scientists that it is used as a form of long-distance communication [vide fig. 33].

4.3 Comparisons of Fish and Whale

Fishes are the first vertebrates on the earth which are having backbones. Jawless fishes, which are developed from prokaryotes, single celled organisms. In MP *Vaiwaswat Manu,* first time saw the tiny fish – *śapharī* [carp] in his hands. As *Manu* changed the habitat [place] of the tiny fish, it grew gradually which indicates the fish evolution [vide 2.2 Development of *Matsya*] in the pre-historic period.

Vertebrates, developed from fish are having special features and adaptations according to their surrounding environment. These vertebrates developed into the land animals known as mammals. Amongst the mammals, some mammals are aquatic

mammals called as 'marine mammals' belonging to the order Cetecea. Some Cetaceans are huge biggest aquatic mammals or giants of nature known as 'whales'.[87]

Misunderstanding of people

Fish is the shortest form of the vertebrates where as whale is a giant appearance of aquatic animals. Whale in the water, have fins similar to the fishes hence it is regarded as a fish by common people but if we studied the whale morphologically and anatomically it shows the same characters of mammals which are seen in human beings as they are also mammals.

In this chapter, Mastya and whale are studied comparatively with their general lifecycle, adaptations and evolutionary changes from the pre-historical periods. This information is summarized shortly in the table 4.3.2

Table 4.3.2 comparative study of Fish and Whale

N.	Fish	Whale
1.	First vertebrates	Only aquatic mammals
2.	Divided into 2 superclasses – Agnatha and Gnathostomata	Belongs the class - Cetaceans, and divided into 2 types – toothed and baleen
3.	Arose in pre-cambriaonic period, before 550-300 million years.	First whale's appearance is still unknown, evolved in Eocene epoch, before 50 million years.
4.	Near about 22000 sp. are	Near about 75 sp. are found.

	found.	
5.	Occure in all over the world, i.e. in fresh and marine water.	Occurs in polar regions maximum and icy water and deep in the ocean.
6.	Food- planktons, small fish.	Food – squid and fish
7.	Swims in water with high speed, fins- helpful for locomotion.	Swims with high speed more than fish, flippers are the locomotive organs
8.	Respiration through gills and scales, use dissolved oxygen	Lungs and blowhole – respiratory organs, they have to come on surface for respiration
9.	Lay eggs and do not nurse young	Give birth like humans and mother nurse up to 1 year
10.	Special features varies according to sp.	Diving, breathing and singing – are the special features
11.	Warm-blooded – body temp. changes according to the surrounding	Cold-blooded, no effect of surrounding temp. on the body
12.	Size varies sp. to sp. only sharks are bigger in size	Huge size varies in the sp. Blue whale is the biggest one
13.	Weight in kg and length in cm to meter	Weight in metric tons and length in meters[feet]
14.	Very useful to humans – as food, medicine and economical source	Useful to human – as food[rarely], mostly for industrial use for making oils, fuel, ornaments

15.	Less storage of energy than that of whale	Great storage of energy – blubber
16.	Fishing is business, sport, a type of entertainment	Whale hunting is prohibited by IWC for the conservation of remaining sp.
17.	Important place in food chain, fooweb.	Because of few sp. important to only their ecosystems.

In MP, Manu replaced the *Matsya* in the river which was 1 yojana [8 miles] in length. The length of this *Mastya* is 8 miles which resembles today's Blue Whale, the biggest mammal on the earth.

4.4 Importance of fish and whale

Evolution of fish shows that fish is the basic element for the gradual development of humans. From the historical studies of the origin of the universe, it may be stated as fish was the first living organism in the water and further development of animals occurred according to theory of evolution up to mammals.

Fish benefit people in many ways. From the ancient time Fish make up a major part of the diet of the people. They play an important role in food-chain sand food pyramids. They have medicinal value for curing many diseases. Fish liver oil is used mostly in medicinal purposes. People have also enjoyed fishing as a sport. Many people keep fish as pets in aquariums. Fishes are also important in the balance of nature as they are the main unit of aquatic ecosystems.

Although, the fishes vary in shape, size, colours, and behaviors they attract the people specially kids. As a result of that, people keep fish as pets in aquariums. Fish-aquariums, fish-food, fisheries and fish bye-products help to gain the economical source for the fishermen and the coastal region people which decrease the unemployment of country.

No one knows how or why the Whale's land living ancestors first took to the water. It may be guessed that to escape from enemies or to find food. Over millions of years these animals gradually changed and developed in ways that better adapted them to life in water. But, even now, modern whales must rise to the surface to breathe.

According to their abundance, whales are distributed all over the world. Their huge shapes and sizes do not affect on their swimming speeds. Sound production is the outstanding characteristic of whales. Whales show the most important mammalian feature, feed young with their milk. They take care of calves up to one year and teach them how to attack or catch the prey. Whale's social behavior is the proof of their intelligence and that's why Dolphins are used to treat handicapped or mentally disordered children. This treatment is known as 'Dolphin Therapy.' No doubt whales have great affinity to humans.

This discussion of fish and whale shows that both the animals have a great importance in the evolutionary development of animal kingdom. Fish is the first stage of vertebral development while whale is the last of aquatic mammal. This morphological study of whales shows the resemblance with the evolution of Matsya-avatar

and it satisfies raised question- why the Lord Visnu had selected first Matsya-avatar i.e. evolution of Matsya Incarnation.

Cetacean Breath Chart [Table 4.2.1]

SPECIES	MAX TIME	MAX DIVEDEPTH
Pacific White Sided Dolphin	5 minutes	210 m
Bottlenose Dolphin	10 minutes	535 m
Killer Whale	15 minutes	250 m
Narwhal	20 minutes	1000 m
Humpback Whale	20 minutes	150 m
Gray Whale	25 minutes	170 m
Fin Whale	30 minutes	500 m
Blue Whale	50 minutes	100 m
Bowhead Whale	80 minutes	300 m
Bottlenose Whale	120 minutes	1000 m
Sperm Whale	140 minutes	3000 m

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[27] Norman J. R. : The History of Fish, ch-6, Pp 103-108,

[28] Kyle Harry M. : The Biology of Fish, p. 255

[29] Hard-shelled animal: an invertebrate animal with several pairs of jointed legs, a hard protective outer shell, two pairs of antennae, and eyes at the ends of stalks. Ex. Crabs, lobsters, shrimp, crayfish.

[30] On. DVD, FISH

[31] Kyle Harry M. : The Biology of Fish, ch-1, p. 19

[32] Khanna S. S. : An Intr., ch-17, p. 396

[33] Norman J. R. : The History of Fish, ch-3, p. 34

[34] a] _____, _____, _____, p. 40

b] Young J. Z. : The Life of Vertebrates, Fish, p. 132

[35] Khanna S. S. : An Intro., ch-21, p. 429

[36] On. DVD, FISH

[37] WBE, vol.-7, Fish, p. 171

[38] Young J. Z. : The Life of Vertebrates, Fish, ch-7, p. 180

[39] On. DVD, FISH

[41] vide Young J.Z. : The Life of Vertebrates, Fish, ch-7, p. 183

[42] WBE, vol.-7, Fish, p. 170

[43] Norman J. R. : History of Fish, ch-6, Pp 145-148

[44] Young J. Z. : The Life of Vertebrates, Fish, ch-7, p. 182

[45] Micro. Stu. Encarta, see Whale Shark and Plankton

[46] Foods : Facts and Principles, ch-45, p. 424

[47] _____, _____, ____, p. 401

[48] Pandey and Shukla : Fish and Fisheries, ch - 45, p. 423

[49] _____, Foods : Facts and Principles, ch-45, p. 402

[50] vide, Khanna S. S. : An Intr….., ch-31, p. 480

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[52] _____, _____, ____, p. 406

[53] vide, Khanna S. S. : An Intr., ch - 31, p. 524

[54] _____, _____, _____, p. 480

[55] On. DVD, Fishery

[56] NBK, vol-1, p. 340

[57] On. DVD, Aquarium

[58] WBE, vol.-7, Fish, p. 15

[59] On.DVD, vide Cetaceans,

Mammals - A class of warm-blooded vertebrate animals that have, in the female, milk-secreting organs for feeding the young. The class includes human beings, apes, many four-legged animals, whales, dolphins, and bats.

[60] WBE, vol-22 , whales, p. 203

[61] The first fossil from 54.8 to 49 millions years ago in Pakistan.

[62] NBK, Vol-20, whale, p. 150

[63a] for details vide www.earthage.org>Scientific Evidences for a Worldwide Flood>a whale fossil

[63b] Mic St. Origin of Whale

[64] WBE, vol.- 23, whale, p. 207

[65] vide www.birds.cornell.edu/brp/research article - 'The Sea Monsters Expeditions'

[66] vide www.birds.cornell.edu/brp/research article - Blue Whale

[67] Coe Makolm : The Natural World, p.119

[68] WBE, whale, p. 208

[69] On. DVD, Cetaceans

[70] vide BICREF research report

[71] Mi, st., Blubber

[72] WBE, vol.-23, Whale, p. 209

[73] Young J. Z. : The Life of Vertebrates, ch - 26 p. 499

[74] On. DVD, Cetacean, vide Cetacean breathing chart

[75] _____ , _____ , Adaptations - Locomotion

[76] WBE, Whale p. 210

[77] Young J. Z. : The Life of Vertebrates, ch - 26, p. 501

[78] Mi.St., see whale- Reproduction

[79] A] On. DVD, Cetaceans – Reproduction

B] vide www.birds.cornell.edu/brp/research article- using cold-war technology to study the distribution and behavior of whales.

[80] On. DVD, Cetaceans, Migration

[81] WBE, Whale, p. 210

[82] a] On. DVD, vide Cetaceans – Intelligence

b] Young J. Z. : The Life of Vertebrates, ch - 26, p. 500

[83] Mic. St., whale

[84] On. DVD, Whale

[85] vide, sound production and communication, by Young J. Z. from 'The Life of Vertebrates', ch - 26, p. 500

[86] vide www.birds.cornell.edu/brp/research - article 'Effects of Human-made Sound on The Behavior of Whales'

[87] NBK, vol. 7, Giants of nature, Pp. 202-3

[*] Sonar - **system for detecting underwater objects:** a system that determines the position of unseen underwater objects by transmitting sound waves and measuring the time it takes for their echo to return after hitting the object.

[*]Larynx - **voice box:** the cartilaginous box-shaped part of the respiratory tract between the level of the root of the tongue and the top of the trachea. In humans and some other air-breathing vertebrates it is the organ of voice production, containing the vocal cord.

[#] Echolocation – a physiological process for locating distant or invisible objects (such as prey) by means of sound waves reflected back to the emitter by the objects. Echolocation is used for orientation, obstacle avoidance, food procurement, and social interactions.

CHAPTER – 5

MODERN RELEVANCE OF MATSYA WITH WHALE

5.1 Relevance of matsya incarnation and whale

Purāṇic literature is very familiar with the ten incarnations of *Viṣṇu* – *Dasāvatāra* of *Viṣṇu*. These ten incarnations are well described in *Purāṇas,* to establish the victory of *Dharma* and supremacy of *Brahmā, Viṣṇu* and *Śivā*. *Matsya Avatāra* is the first incarnation of Lord *Viṣṇu* to protect the earth from the wicked demon *Hayagrīva*. This figaht between the Lord *Viṣṇu* and *Hayagrīva* is well known in the *Purāṇic* literature.[1] This story of battle of the Lord *Viṣṇu* and *Hayagrīva* [1b] is very helpful to explain the modern relevance of Whale with the *Matsya Avatāra*.

Here, it is an attempt to show some similar characteristics of *Matsya Avatāra* and whales with the correspondence of following points.

5.1.1 Selection of Matsya

To find out *Hayagrīva* from the deep ocean only fish form of creature was suitable to swim with a great speed in the deep ocean unless Lord *Viṣṇu* would have selected the another big form of creature. It is called as *Matsya* because it appeared first in the hands of Manu in the form of a small fish and gradually developed into big fish. Generally at the first sight common people call the whale as 'fish', as it lives in the water and looks like a fish.

5.1.2 Giant appearance

Lord *Viṣṇu* had incarnated Himself in the giant form of *Matsya* to save the *Vedas* from the wicked demon, *Hayagrīva* who had hidden in the deep ocean.[2] This giant form of *Matsya* resembles with today's marine mammals-WHALE [3][specially Blue Whale]. Whales are the wonders of nature and their huge sizes and shapes are responsible to call them largest animals on the earth. These Whales can damage big ships or boats which indicates their great power.

5.1.3 Great speed of swimming

Matsya had swum with great speed in the depth of the ocean and had the great power to fight with the wicked demon. At the time of the deluge, the giant *Matsya* was able to swim very fast in that flood and protected Manu and the seeds of all living beings. Modern Whales live in the polar oceans or in the deep oceans [3000-5000 feet.] of the world. They can live underwater up to two hours without breathing on the surface. [4] They can swim as fast as a huge cruise can.[5]

5.1.4 Longest migration

Hayagrīva hid in the bottom of the ocean. To find out *Hayagrīva*, it was not impossible for the Lord *Viṣṇu.* It may be happened that *Matsya* had searched the whole bottom of the ocean. At the time of deluge, the whole world was immersed in the water and darkness. *Matsya* swam the floods of water to save Manu and all living beings. No one can imagine the long distance that *Matsya* had

travelled his journey. In the same way, Whales can swim from the polar oceans throughout the world, crossing the thousands of kilometers distance during their migrations for breeding.[6] They have a great capacity of food storage so they can live without feeding many days.

5.1.5 Horn-dorsal fin

After killing the demon *Hayagrīva*, the giant *Matsya* had come towards Manu with a boat. He had told Manu to tie up the boat to his horn, as the whole Universe was immersed in the water. That horn of giant *Matsya* resembles with that of a dorsal fin of a **Fin Whale**, which is entangled by whale hunters to follow them for catching. In this way Lord *Viṣṇu* had protected the Universe from the deluge in the form of his first incarnation – *Matsya Avatāra.*

These features of whales coincidently match with that of *Matsya Avatāra* - a giant form of fish. This resemblance of *Matsya* with Whale shows that Whales have great power to fight with enemies, great swimming speed, survive in deep oceans and may have the ability to save the world in future. One more mysterious thing is that in the age of *Purāṇas, Purāṇic* writers were familiar to the animal kingdom and their environment.

5.2 Whale hunting [Whaling]

5.2.1 History of Whaling

Whaling began in prehistory for whale meat and whale oil. Stone Age people were hunting whales for food as long ago as

2,200 B.C. They hunted slow-swimming, coastal species such as the bowhead, grey and right whales. This subsistence hunting is still practiced by some societies such as the Inuit (Arctic or Greenland people) people of Greenland and North America, where the whale plays an important part in the people's survival. The fishermen harpooned small porpoises then targeted to whales. The chief whalers of Europe, the Basque people of southern France and northern Spain established the first large whaling industry during 900's. They hunted chiefly one type of whale, baleen.[7] Basques burnt whale oil in lamps and used baleen in such articles as dress hoops, and whips. Many European nations began whaling during 1600's. Dutch and English explorers reported that the Arctic waters were filled with whales. These reports attracted whalers from many countries, including Denmark, England, Germany and the Netherlands.

The first American whalers were Indians, who hunted from shore in much the same way as the early Basques. By 1770, Americans were hunting

Sperm Whales throughout the Atlantic Ocean. Whalers obtained three valuable substances from Sperm Whales – sperm oil, spermaceti and ambergris. The American sperm whaling industry had its great prosperity from about 1820 to 1850. During this period, it employed 70,000 persons and killed about **10,000 whales** annually.[9] According to the scientist Hal Whitehead, this whale hunting became an important part of the economy and culture of the Alaskan and Canadian Eskimos, the Indians of the northwest coast of North America, and some Japanese fishermen.[10]

Table 5.2.1 Whlae Population Estimates [8]

Species	Orig.Pop._	Est.Pop.__	Year protected
Blue	228,000	11,700	1967
Bowhead	30,000	7,800	1935
Bryde's	90,000	43,000	1986
Fin	548,000	110,000	1986
Gray	+20,000	18,000	1935
Humpback	115,000	10,000	1966
Minke	+490,000	880,000	1986
Right	+100,000	3,200	1935
Sei	256,000	54,000	1986
Sperm	2,400,000	1,950,000	1985

5.2.2 Modern whaling

Commercial whaling - Commercial whaling during the 19th century wiped out most of the world's whale population.[11] Because whales mature and breed slowly, numbers will take a long time to recover. By 1925, whalers also had developed the factory ship. A modern factory ship fleet [group of naval ships] included up to 12 diesel-powered catcher boats and a crew of about 400. Modern

whaling techniques proved highly effective. The whale is killed by a 90kg, 2 meter -long iron harpoon, shot from a 90mm cannon. The harpoon head contains a time-fuse grenade which, literally, blows the whale's insides apart second after impact. This does not usually kill the whale immediately and it may suffer for hours before finally dying.[12] As a result, more whales were killed during the19th century. The whale population estimation chart shows the original population and estimate population of whales during the 20th century[vide table 5.2.1]. Whalers have hunted so many whales up to extinction of some species. The number of whales killed worldwide peaked in 1962, when whalers killed more than 60,000.

Since the early 1900s whale hunters have had the means to wipe out these great beasts- as hunters have wiped other creatures in the past. In fact by the mid 1900s the Blue whales, Right whales, grays and humpbacks had been hunted almost to extinction. During the 1930-31season 30,000 blue whales were killed and processed. By the 1950s the blue whale had practically disappeared. The whalers then started hunting the smaller species such as the fin, sei and minke whales.[13]

5.2.3 Incidental whaling

There is no global organization responsible for the regulation and oversight of the direct catches of the smaller whales species, dolphins and porpoises. The use of drift (floating fishing net) and set gillnets to capture other fish species which have caused the deaths of many thousands of dolphins. Large numbers of dolphins are also killed by becoming entangled in the long drift nets used in

oceanic fisheries.[14] Recent studies of the Whale Centre of New England have shown that over 60% of North Atlantic right whales and 70% of New England humpback whales have become entangled at some point, and up to 20% of humpbacks may become entangled each year.[15]

Whale hunting was done mainly for whale products such as whale oil, whalebone, spermaceti [from sperm whale] and thick blubber. Some small whales are hunted for food and marketed commercially. Whale hunting and sport fishing are major attractions for the tourists who visit each year.[16] Captured whales were ground up on factory ships to make lubricants, soaps, cosmetic products and animal feeds. In the recent days, **Japan** and **Norway** are the primary whaling nations.

After the World War II, whale oil was so important to Europe and meat to Japan and Russia, as a result of that, new larger factories were built. European companies withdrew after the 1962-63 season, leaving the whaling chiefly to the Soviets and Japanese. Soviet enterprises were subsidized, and modern refrigeration allowed the Japanese to make a valuable delicacy out of meat. No factories were sailed after 1978, and by the 1980s the international whale trade was dead except small-scale coastal whaling.[17]

5.2.4 Threats to whales

Pollution -- Pollution of marine environment is clearly going to have an impact on the whales and dolphins, since they spend their whole lives in the sea. The terrestrial waste, so that chemicals, oil, debris, sewage and nuclear materials are all deposited in the oceans,

which can impact directly on the marine animals or indirectly through the prey species that make up their food. As the whales are long-lived animals, chemical pollutants accumulated in their tissues and can have significant implications for their survival.

They use echolocation so they are particularly vulnerable to noise pollution. Underwater noise pollution from ship motors, or drilling and production, and the operation of undersea machinery may also threaten whales. Scientist believes that the intensity of noise levels in some ocean areas may interfere with the transmission of whale's ability to locate food. Recent evidence suggests that some sonar is loud enough to cause physical injury to whales.[18]

Climate change -- Climate change could have a marked impact on the ocean environment as a whole. Because cetaceans are at the top of the food chain, they may be at risk. The amount of sea ice in Antarctica, for example, is a vital factor in krill production which is a major part of many whale diets.[19] Greenhouse gas emissions are predicted to cause changes in global air and sea temperatures which can rise the sea level, and reduce sea ice cover. These impacts will affect the marine ecosystems and whale population.

Whale-watching -- Whale-watching expeditions are a popular boating activity which prevents whales from hunting for food and separates mothers from their calves as a result whales may exhibit aggressive behaviors. These actions cause boats to accidentally collide with the whales and injure them.

5.3 Whale conservation

Whales have been hunted by humans throughout history for their meat, bones and blubber. Commercial whaling during the 19th century wiped out most of the world's whale populations. Because whales mature and breed slowly, numbers will take a long time to recover, if they do at all.

Many of the larger whales were killed by whalers for many years. As a result some species such as blue, humpback, right and bowhead have been threatened with extinction. Gray whales, like most whales, are still being threatened by humankind's actions, such as the polluting of our oceans and the constant threat of being hunted again.[20]

5.3.1 International Whaling Commission [IWC]

More than 2 million whales were killed by mechanical techniques in the early 20th century.[21] Hunting for Blue whales in the Southern Hemisphere was banned by international agreement. In 1931 the League of Nations organized an International Whaling Convention, but this had little success towards restrictive regulations. International Whaling Commission (IWC) [22] was established in 1946 to conserve the whale stocks. It prohibited the hunting of Right, Gray and Blue whales and regulated whaling industries. In 1970 the commission limited the use of factory ships. In 1982 the IWC voted for a moratorium [temporary halt] on commercial whaling. It was agreed by the members of IWC and they halted commercial whaling during 1986-90.[23]

There is, however, a clause in the rules which allows countries to issue permits to kill whales for research. Japan uses this loophole to hunt whales and the meat from their research ends up for sale on the domestic market. The Japanese whaling fleet [group of naval ships] left for the Antarctic in December 2006, with the intention of killing 850 minke whales and 10 fin whales.[24] Japan, along with Iceland, Norway, and South Korea announced that although they would be killing whales and selling the meat and oil commercially, they would be whaling for 'scientific purposes' in order to learn more about whales.[25] (Today many species remain highly vulnerable to extinction, particularly right, gray and blue whales.)

Through the years the IWC has acted to moderate whaling, and it instituted a moratorium [temporary halt] on the commercial whaling in 1986 after decades of over hunting had already depleted the populations of many whale species. By 1988, all nations had halted commercial whaling. Native people- Eskimos of Alaska, Greenland and Russia, are also allowed to continue traditional whale hunting that has been

5.3.2 Whale conservative acts

To prevent the whale hunting, many strict rules and regulations were enacted for the conservation of marine ecosystem. Some are discussed here with the point of conservation view.

1] Marine Mammal Protection Act (MMPA) [U.S.]

This was enacted on 21st October 1972 in U.S. All marine mammals are protected under the MMPA. It prohibits to hunt, harass,

shoot or kill any marine mammal in U.S. waters and by U.S. citizens. It was based on some policies and findings as below --

- Some marine mammal species may be in danger of extinction as a result of human activities.
- These species or stocks must not be permitted to fall below their optimum sustainable population level.
- Measures should be taken to replenish [to restock depleted items] these species or stocks.
- There is an adequate knowledge of the ecology and population dynamics.
- Marine mammals have proven to be resources of great international significance.

2] Endangered Species Act (ESA) (U.S.)

Congress passed the ESA in 1973 and it provides for the conservation of species threatened, and the conservation of the ecosystems on which they depend. Similar prohibitions are followed to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, and engage any marine mammal in any such conduct..

3] Species at Risk Act (SARA) [CANADA]

SARA became law in 2003, and the prohibitions under the Act went into effect in June 2004. Once a species is listed under the Species at Risk Act, it becomes illegal to kill, harm, harass, capture or take an individual of a listed species. No person shall destroy any part of the critical habitat of any listed species.

4] **The International Whale Conservation and Protection Act** [U.S.]

It was introduced on 18 May 2009. This act would promote international efforts to conserve and protect the world's whales throughout their range, and reassert the United States as a global leader in whale conservation. The Act would strengthen whale conservation and protection efforts of relevant international bodies. It would reduce and, where possible eliminate, sources of human-caused death, injury, harassment and disturbance of the world's whales.[26]

Some other acts like Fisheries Conservation Act and Coastal Zone Management Act (1972) prohibited the whaling nations from hunting, following and entangling the whales for their commercial or domestic purposes. The coastal studies organization of SBNMS explains the purpose of this 1972 law that it was to prevent unregulated dumping of material into the oceans, coastal, and other waters that endanger human health, welfare, and amenities, and the marine environment, ecological systems and economic potentialities. Within this law, the transportation and dumping of radioactive, chemical, or biological substances were forbidden.[27]

As the time passes, Whale population estimates the IWC is setting ever stricter controls on the killing of whales worldwide. [28] The best way to conserve whales may be to allow carefully monitored whaling within IWC regulations rather than provoking a free- for-all outside the commission. A new WWF report –'Small Cetaceans : The Forgotten Whales' states that inadequate conservation measures are pushing small cetaceans – such as

dolphins, porpoises and small whales – toward extinction as their survival is overshadowed by efforts to save their larger cousins.[29]

With the adoption of rules to protect them, many whales have made a comeback. But their survival remains fragile, and whaling -- along with hazards such as ocean noise, ship strikes, pollution, unsustainable fishing practices, oil and gas development and climate change -- continues to be a threat to these intelligent creatures, which play a significant role in ocean ecosystems.[30]

5.4 Relation with humans

Whales were little understood for most of human history as they spend up to 90% of the lives underwater, only surfacing briefly to breathe. They also include the largest animals on the planet, so it is not surprising that many cultures, even those that have hunted them, feature them in their mythologies. There are many mythological references of whale relation with humans. In China, Yu-kiang, a whale with the hands and feet of a man was said to rule the ocean.[31]

In Icelandic legend a man threw a stone at a fin whale and hit the blowhole, causing the whale to burst. The man was told not to go to sea for twenty years but in the nineteenth year he went fishing and a whale came and killed him.[32a] In East African legend King Sulemani asked God that He might permit him to feed all the beings on earth. A whale came and ate until there was no cornleft and then told Sulemani that he was still hungry and that there were 70,000 more in his tribe. Sulemani then prayed to God for forgiveness and thanked the creature for teaching him a lesson in humility.[32b]

The King James Version of the Bible mentions whales four times[33] The story of Jonah being swallowed by a whale also is told in the Qur'an.[34] Others, such as the Tlingit Indians of the northwestern coast of North America, tell stories of humans being directly involved in the formation of dolphins and whales and their behaviors, again creating a sense of responsibility towards them.[35] Some cultures associate divinity with whales, such as among Ghanaians and Vietnamese, who occasionally hold funerals for beached whales, a throwback to Vietnam's ancient sea-based Austro-Asiatic culture.

An article about 'The Whale's Tale' of Carnegie Magazine mentions that there are 42 species, and numerous fossil whales known from New Zealand's waters, and this exhibition gives scientists an opportunity to share some of this diversity and our complex and varied relationships to them, with the rest of the world. "The whale is the carrier of our culture," says Derek Lardelli, a Mäori skin-marking—artist who traveled with the *Whales* exhibition last year to the National Geographic Museum in Washington, D.C. The exhibition focuses on that relationship between the whale and the Mäori people.[36] New Zealand now is a leader in the conservation and protection of whales, which were once killed worldwide by the hundreds of thousands annually to the point of near extinction. "In the late-1960s and '70s, the humpback whale became a symbol for conservation," says curator van Helden. "Suddenly, whales became something we recognize as social creatures."[37]

A number of coastal peoples include cetaceans in their society with carvings, paintings, clothing, and even ceremonies. Many

different cultures throughout the world contain stories and legends about marine mammals. These stories reflect their cultural beliefs and traditions regarding cetaceans. In many of the stories that concern the origin of dolphins, several cultures such as Greeks, Romans, and Chumash Indians tell of humans being turned into dolphins, thus creating a very strong cultural bond with them.[38] There are also many reports of cooperative associations between humans and dolphins and dolphins helping swimmers, as well, or simply freely interacting with humans in the water.

From the above discussion, it may be cleared that historical and modern whaling reduced the depletion of cetacean population and health of marine environment. As the whales are the biggest animal on the earth, still they are not safe. Greedy humans have killed many species of whales up to extinction. It seems true the thought of Gandhiji – "Earth has enough to satisfy everybody's need but not anybody's greed." Many acts are made for the conservation of the whale population but there are loopholes in laws and no strict actions that's why some countries are still hunting the whales.

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[4] vide cetacean breath chart, table 4.2.1

[5] vide 4.2.7 locomotion

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[8] Estimates from Congressional Records Service of the Library of Congress April, 1994, ibid www.whales.org

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CONCLUDING REMARKS

After the detail study of the MP, it seems that *Purāṇas* are not only the treasures of interesting stories but they described the scientific attitudes of the Universe and proved with the help of the ten incarnations of Lord *Viṣṇu*.

In the first chapter, introduction of *Purāṇas* is supported by etymology of *Purāṇas*, *pañcalakṣaṇas* of *Purāṇas*, other references of Matsya found in Sanskrit literature, these are mentioned to prove the antiquity and popularity of *Purāṇas*. Age of *Purāṇas* is discussed with the different openions of scholars.

Importance of MP, *avatāravāda, Matsya avatāra*, and conversation of Manu-Matsya, these points are described in detail. *Dasāvatāras* of *Viṣṇu* are compared with the evolutionary developments of animals. A brief introduction of *Vedavyāsa* is given as he was the partial incarnation of *Viṣṇu* and without whom we could not study the *Purāṇas*.

In the second chapter, origin of the Universe is explained with reference to mythology and western literature. Manu asked Lord Matsya to enlighten him on the problems of cosmogony, universal dissolution, divine genealogies, etc. then the Lord proceeded to expound the world-egg theory or the Birth of the *Brahmāṇḍa*. This philosophy is explained in the form of Golden-Egg i.e.

Hiraṇyagarbha. He is the World Soul (*Mahān Ātmā*), the Cosmic Egg, that arises out of cosmic waters and engages Himself in the creation of forms and beings. He is the First Born (prathamaja), who manifests forms that are already contained in Him.

To show the evolution of Matsya, based on Darwin's theory of evolution, geological history of the animal kingdom is determined. Fossils study is essential to look back into history

Flood legends of western countries support the Hindu concept of, *Ekārṇava samudra* and formation of the sun and moon and other creatures. Afterwards, conservation and development of Matsya [*Śaphari*] protected by Manu, in different habitats, is compared with the modern species found in different aquatic places.

The third chapter contains the selective references, besides *Purāṇas* literature, mainly *Jyotiṣa śāstra*, *Āyurveda* and *Matsyadeśa* from MBh. *Jyotiṣa śāstra* prefers, *Mīna rāśi* is the one important zodiac sign amongst twelve zodiac signs. In the *Āyurveda*, the different types and uses of Matsyas according to their size and habitats are mentioned. Matsyas [people] were brave and important community in the period of MBh, as a region of *Bhāratavarṣa* was known by this community as '*Matsyadeśa*'.

In the fourth chapter, fish and whale, morphological information of fish and whale is discussed regarding to Zoology. There are many types of fish, which are similar to the fishes described in *Āyurveda*. Fishes having special features, adaptations are

mentioned here. They are important source of food for world that's why economic importance, their medicinal uses, and their significance in aquatic ecosystem, are explained in detail. Here, types of whales, special features and behaviors are discussed in brief.

In the fifth chapter, modern relevance of Matsya with whale is stated on the basis of some comparative observations. Here, it is an attempt to show some characteristics of Matsya creature, giant appearance, a great speed of swimming and power of longest migration between Polar Regions.

Every animal has its right to live its life on this earth, but due to selfishness of human, whale hunting is increased at pick level and some of whales are extinct now-a-days. Whale hunting along with hazards such as ocean noise, ship strikes, pollution, unsustainable fishing practices, oil and gas development and climate change continues to be a threat to theses intelligent creatures, which play a significant role in ocean ecosystems.

Collisions with ships and entanglement in fishing gear threaten the North Atlantic right whales with extinction, while the critically endangered western North Pacific whales are at serious risk because of intensive oil and gas development in its feeding grounds.

Many conservation acts and commissions are implemented to save the whales. Hundreds of whale conservation societies, volunteers and research institutes work together to protect these whales. Rescue teams of scientists and experts save the

disentanglements of whales from last thirty years. The scientific information can lead to better protection for the whales and their habitat along with increasing our understanding of whales in general.

From the overall study of the 'evolution of Mastya', one may remark that –

- *Purāṇas* were not a closed literature like the *Vedas* or *Upniṣadas,* but there was something in them with the possibility of endless augmentations of literature.

- *Purāṇas* are the mythological texts, which explain the great Universal truths in the form of historical narratives, stories, legends and dialogues. These *Purāṇas* are for the benefits of common people who would find the arguments and concepts of the *Vedas* difficult to understand.

- The *Vedas* and *Purāṇas*, together have created a coherent and supportive network of values and ethics and of a way of life itself. *Vedas* and *Purāṇas* are not only the origin of Indian culture, religion, philosophy, but also are the origin of social, political, and the most important thing they cover all the facets and teach human beings to bring togetherness with neighbours and our selfsoul.

- *Purāṇas* have preserved a wonderful record of spreading religious movements, Indian etiquettes and knowledge of earth evolution i.e. *sṛṣṭī-vidyā.*

- The *Vedas* and *Purāṇas* together have created a coherent and supportive network of values and ethics and a way of life.

- Amongst 18 *Purāṇas* with the help of the ten incarnations of Lord *Viṣṇu*, MP is the most valuable *Purāṇa* because *Matsya* incarnation is the first incarnation of Lord *Viṣṇu* from His 10 incarnations i.e. '*Daśāvtāras,* which show the geological development of animal kingdom, vertebrates to mammals. This development explains why the Lord appeared firstly in *Matsya-avatāra*.

- The concept of *Ekārṇav Samudra*, why *VIṣṇu* is called *Nārāyaṇa*? How *Manu* protected the tiny living fish? How *Śivā* destroyed the Universe and how new life is created from the Golden Egg? These and many other similar problems of symbolism have been faced in the present study explaining the terminology of the MP.

- The remarkable appearance of Lord *Viṣṇu* is considered as persevere of Universe. *Purāṇas* are not only the treasures of interesting stories but they described the scientific attitudes of the Universe and proved with the help of the ten incarnations of Lord *Viṣṇu*.

- Destruction and creation of the Universe [Golden Egg] indicates the birth and death cycle of each and every living thing, which is the basic principle of environment [जातस्य हि ध्रुवो मृत्युः ध्रुवं जन्म मृतस्य च।].

- The word "*bṛa*" means "bursting out or bringing forth" and "ahm" means ego. Brahma is therefore he who brings forth many "ahms" or egos or beings into this world using his divine power and matter and pouring life (breath) into them. *Hiraṇyagarbha* is not an eternal being, but comes into existence at the beginning of creation and becomes dissolved in *Iśwara* at the end of creation.
- He is the *Sūtrātman* (the soul of a necklace) the thread on which all beings and all the worlds (the world of the devas, of the ancestors, of the humans, of the demons etc) are strung like beads in a necklace.
- Golden Egg or *Brahmàõóa* floated in the water which is the same with that of *Matsyàõóa*- the fish egg. Here, there is similarity in the birth of the Universe and the birth of fish– the first unit of animal kingdom. Not only this, but there is very close resemblance between the developing child in the womb called fetus and the *Brahmàõóa*.
- Geological studies explain the different period-zones, where growth of animal kingdom is shown clearly, which states the fishes at the bottom level while human or whales [mammals] are on the uppermost level. The same principle is observed in the concepts of *Dasāvatāras* and proved that *Purāṇic* writers were familiar to the world of science.

- Flood legends around the world are similar to the Matsya incarnation concept of Hinduism.

- To show the unique place and importance of Matsya in Sanskrit literature, *Jyotiṣa śāstra*, *Āyurveda* and *Matsyadeśa* from MBh, are included.

- Fish has important role in the balance of nature and food web. It is the main unit of aquatic ecosystem. MP also shows the conservation and awareness of environment by protecting the tiny fish [*Śaphari*].

- To determine the scientific description of fish and whale and to understand the composition of these modern species with that of ancient species described in Sanskrit literature the comparative study is undertaken.

- *Matsya* Incarnation has relevance with the modern whales on the basis of its body structure, giant appearance and great power of swimming and fighting in the deep ocean. This incarnation is also relevant with fish because Lord *Viṣṇu* appeared first in the form '*Śapharii*' in the hands of *Vaiwaswata* Manu.

- However, the whales and dolphins are related with the human, as they are main food source for their life. These animals have important place in their different cultures and traditions of many communities throughout the world. Now-a-days, these

marine mammals are useful for the scientists to study the bottom of the ocean.

- The Universe is originated from the water deluge. According to embryology, embryo develops in the fluid of mother's womb. This proves that the new creation always originates from the water in the form of fish tadpole like structures.

- From the *Śaphari* in Manu's hand upto the giant Matsya incarnation at the time of deluge symbolizes the fish as first level of animal development while giant Matsya incarnation symbolizes the last level of animal development.

- Matsya incarnation was nothing but the ***'Whale-avatāra'*** of *Viṣṇu*, it may not be false if one considers, and now-a-days, also considered as whales are the Divine Incarnation having Divine powers, extraordinary intelligence and great affinity towards humans.

- Where there is end of animal kingdom, that species is saviour during the dissolution and again there is new creation from the water dissolution. That means, this death and birth cycle starts from fish and ends with whale, which resembles the evolution of Matsya up to the whale according to MP.

- Origin of whales is still unknown, so if it is said that whales are the Divine Incarnation, and whales are the only creatures, which will survive at the time of deluge in future, then it should not be wrong.

Scope of the further research

Purāṇas are the real sources for the study of Indian cultures, philosophy, and tradition. But scientific attitudes and comparative study of *Purāṇas* are still neglected by the scholars. *Purāṇas* can be studied with different views. There is a scope of further research in *Purāṇas* like *Vāyu Purāṇa* and *Agni Purāṇa*. The concept of time [*kālgaṇanā*], solar system history of flora and fauna, these topics of *Vāyu Purāṇa* can be studied with the modern relevance. MP also has topics like architecture and flora and fauna. The geographical survey of *saptadwīpa*, mountains and rivers, can be studied for the further research on the basis of *Purāṇic* literature.

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Fig 1

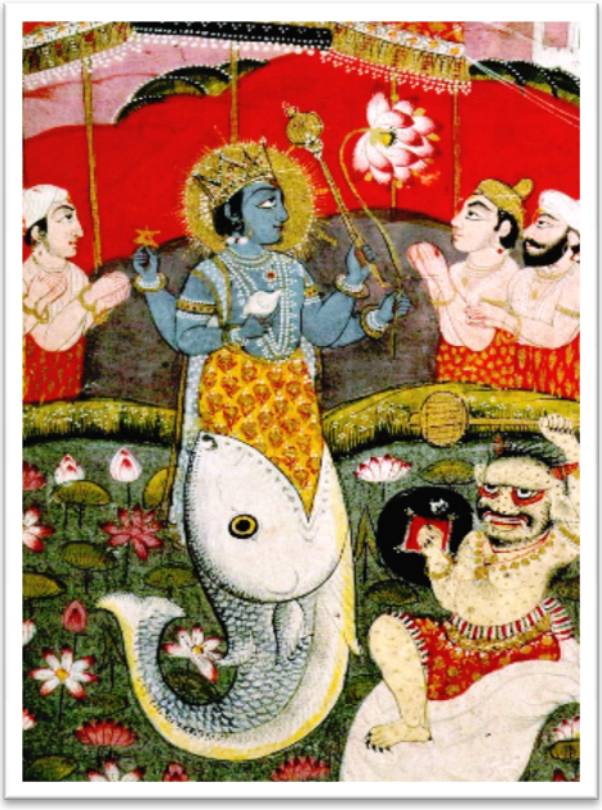


Fig 2

Fig 3

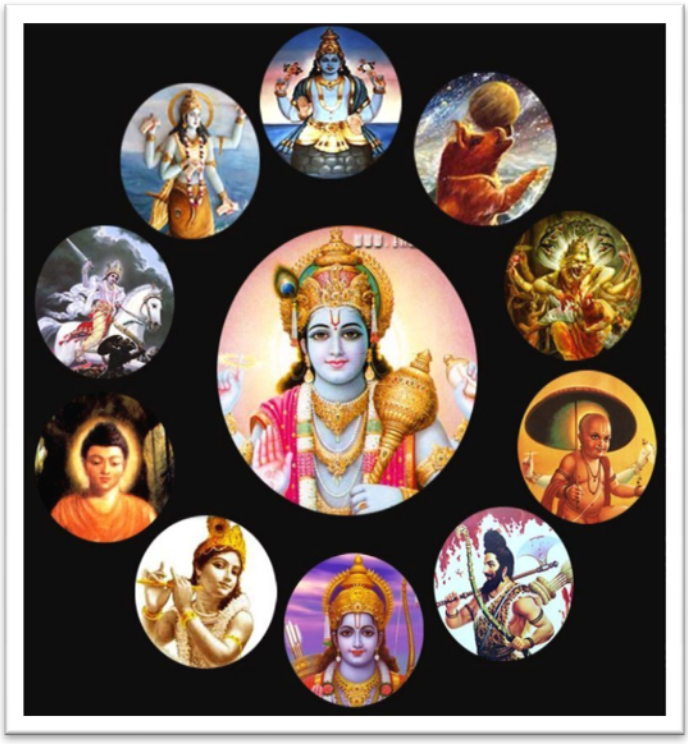


Fig 4

Fig 5

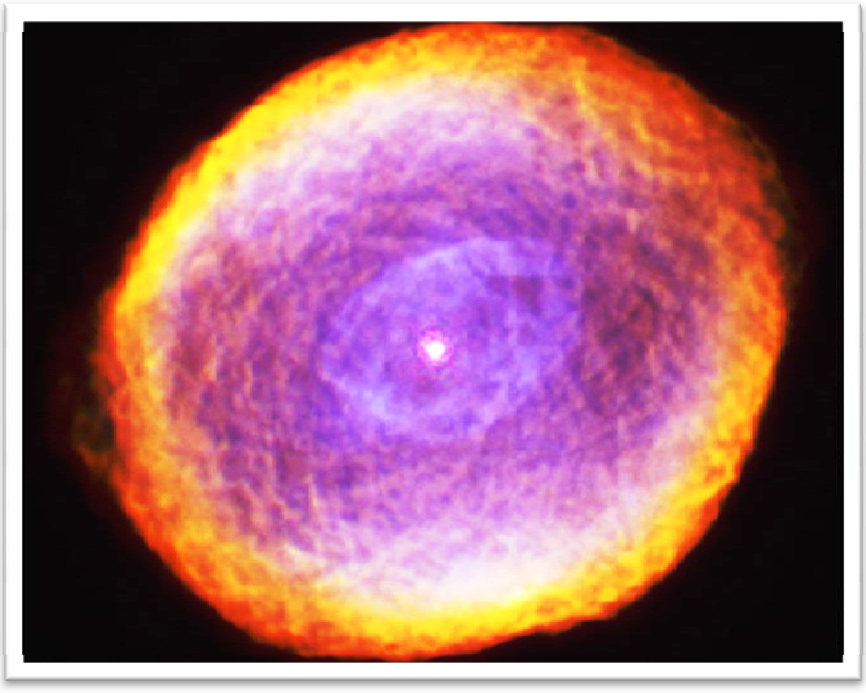


Fig 6


Baby Evolution - Conception to Birth
Racing to Fertilization
2 WEEKS
4 WEEKS
6 WEEKS
7 WEEKS
8 WEEKS

Fig 7

Fig 8

Fig 9

Fig 10

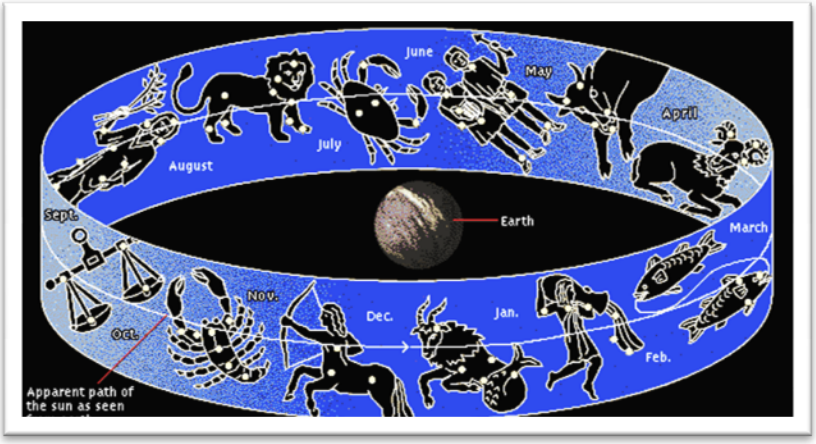


Fig 11

Fig 12

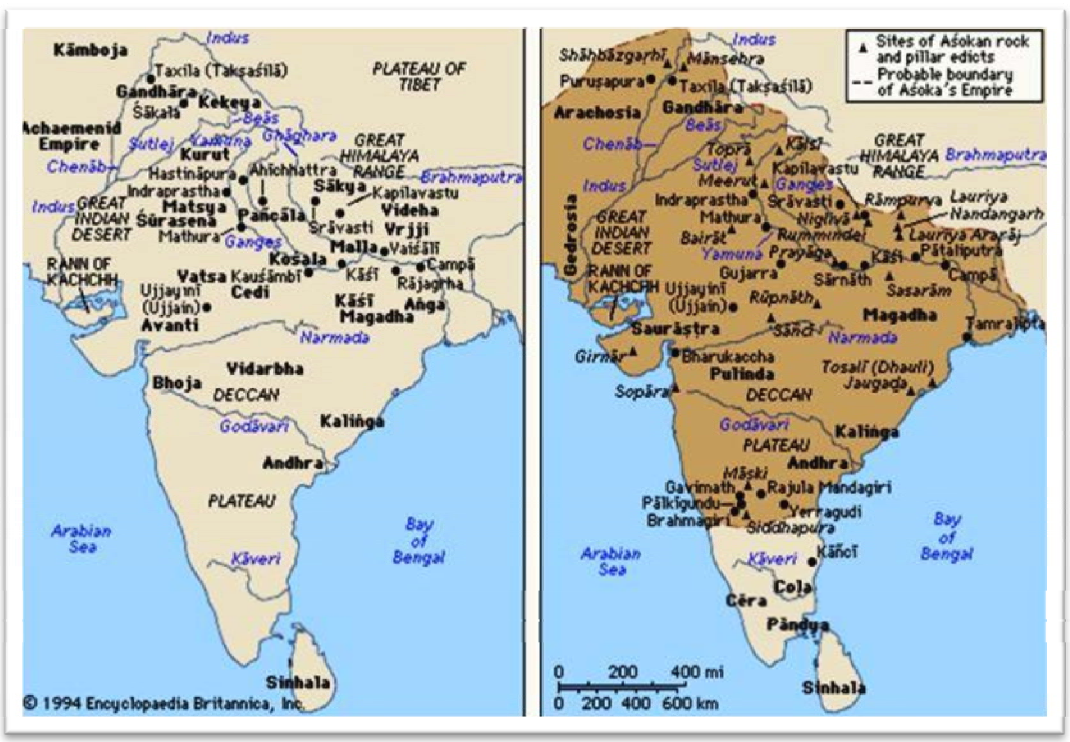

Indus
Kāmboja
Taxila (Takṣaśilā)
PLATEAU OF TIBET
Gandhāra
Śākala
Kekeya
Achaemenid Empire
Beās
Sutlej
Ghāghara
GREAT HIMALAYA RANGE
Kurut
Chenāb
Hastināpura
Ahichhattra
Brahmaputra
Indraprastha
Sākya
Kapilavastu
Indus
GREAT INDIAN DESERT
Matsya
Śūrasena
Pañcāla
Videha
Śrāvasti
Vrjji
Mathura
Ganges
Malla
Vaiśālī
Kosala
RANN OF KACHCHH
Vatsa
Kauśāmbī
Kāśī
Campā
Rājagrha
Ujjayinī (Ujjain)
Cedi
Avanti
Kāśī
Magadha
Aṅga
Narmada
Vidarbha
Bhoja
DECCAN
Godāvari
Kaliṅga
Andhra
PLATEAU
Arabian Sea
Bay of Bengal
Kāveri
Sinhala
© 1994 Encyclopaedia Britannica, Inc.
Indus
Shāhbāzgarhī
Mānsehra
Puruṣapura
Taxila (Takṣaśilā)
Sites of Aśokan rock and pillar edicts
Probable boundary of Aśoka's Empire
Arachosia
Gandhāra
Beās
Chenāb
GREAT HIMALAYA RANGE
Brahmaputra
Toprā
Sutlej
Kapilavastu
Meerut
Ganges
Indus
Indraprastha
Śrāvasti
Rāmpurva
Lauriya Nandangarh
Gedrosia
GREAT INDIAN DESERT
Mathura
Bairāt
Rummindei
Yamuna
Prayāga
Kāśī
Pātaliputra
RANN OF KACHCHH
Gujarra
Sārnāth
Campā
Sasarām
Ujjayinī (Ujjain)
Rūpnāth
Magadha
Saurāṣtra
Sāñcī
Narmada
Girnār
Bharukaccha
Pulinda
Tosalī (Dhauli)
Jaugada
Sopāra
DECCAN
Godāvari
Kaliṅga
PLATEAU
Andhra
Māski
Rajula Mandagiri
Yerragudi
Brahmagiri
Siddhapura
Bay of Bengal
Arabian Sea
Kāveri
Kāñcī
Cola
Cēra
Pāndya
0 200 400 mi
0 200 400 600 km
Sinhala

Fig 13

Fig 14

Fig 15

Fig 16

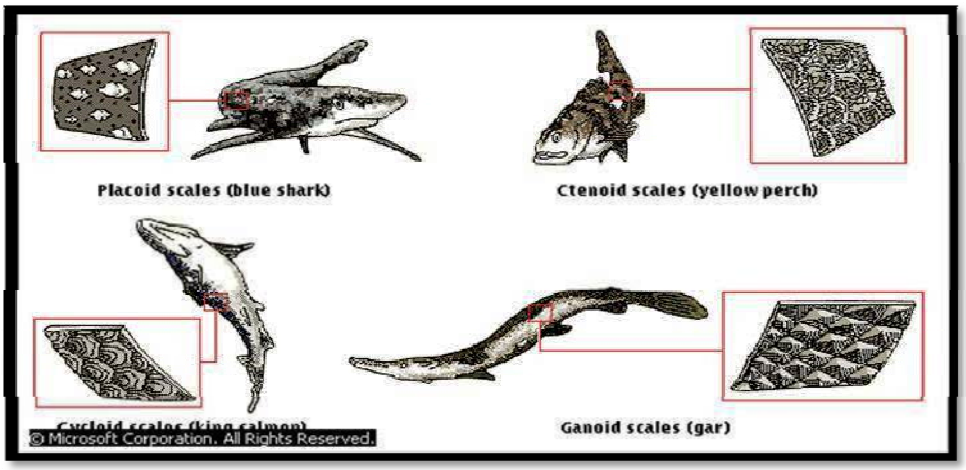


Fig 17

Fig 18

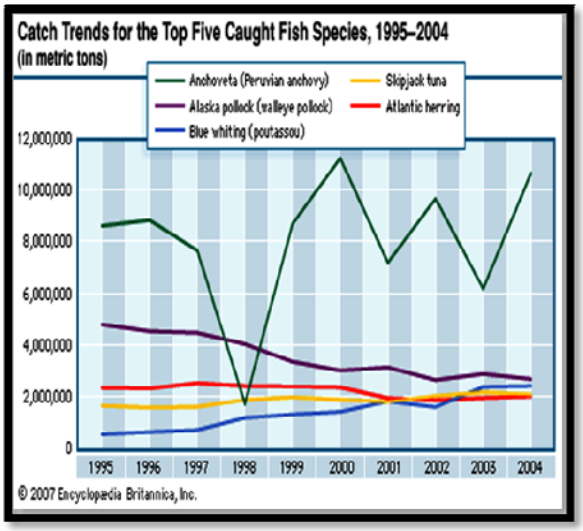


Fig 19

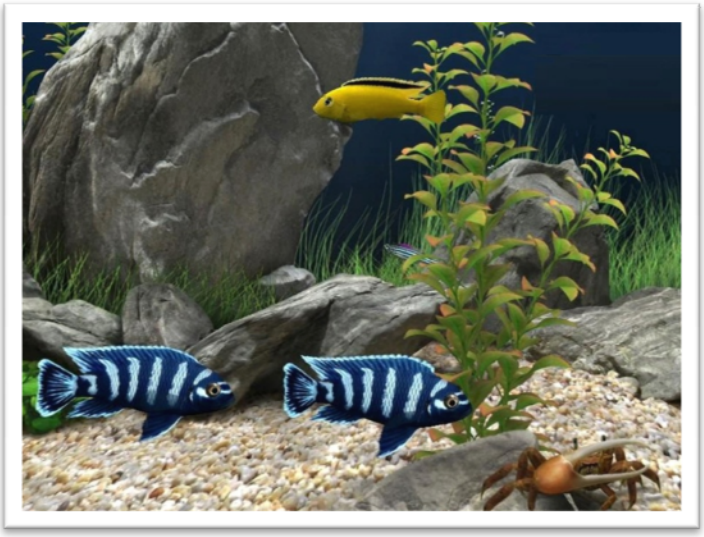


Fig 20

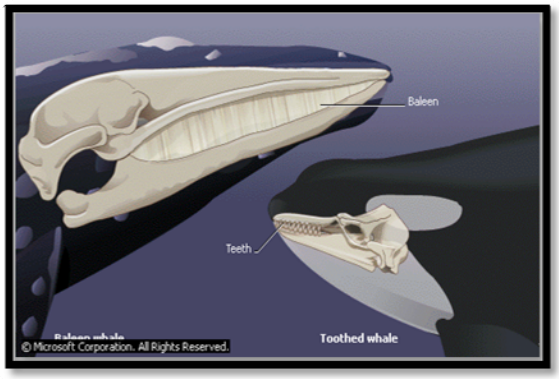


Fig 21

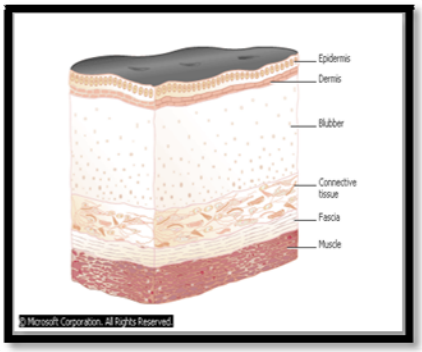


Fig 22

Fig 23

Fig 24

Fig 25

Fig 26

Fig 27

Fig 28

Fig 29

Fig 30

Fig 31

Fig 32

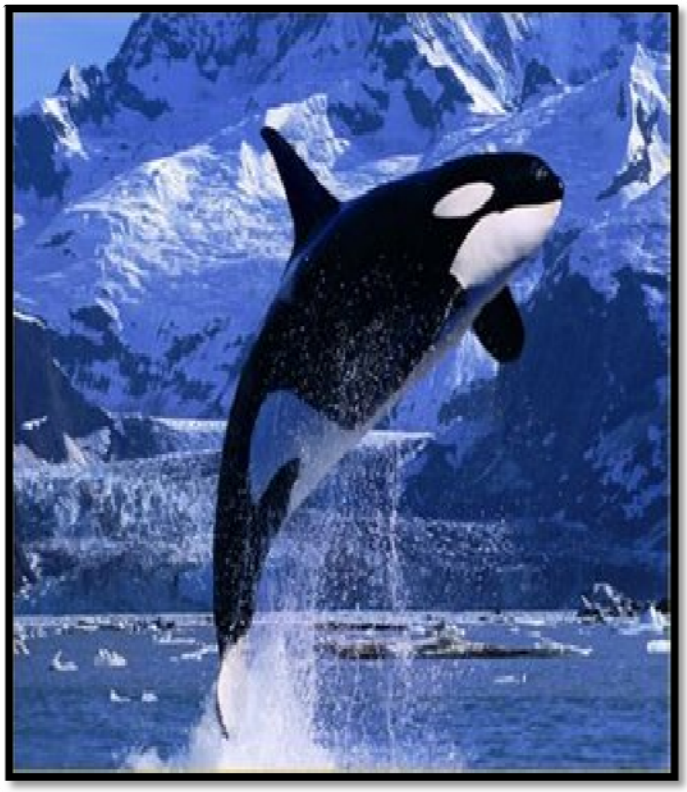
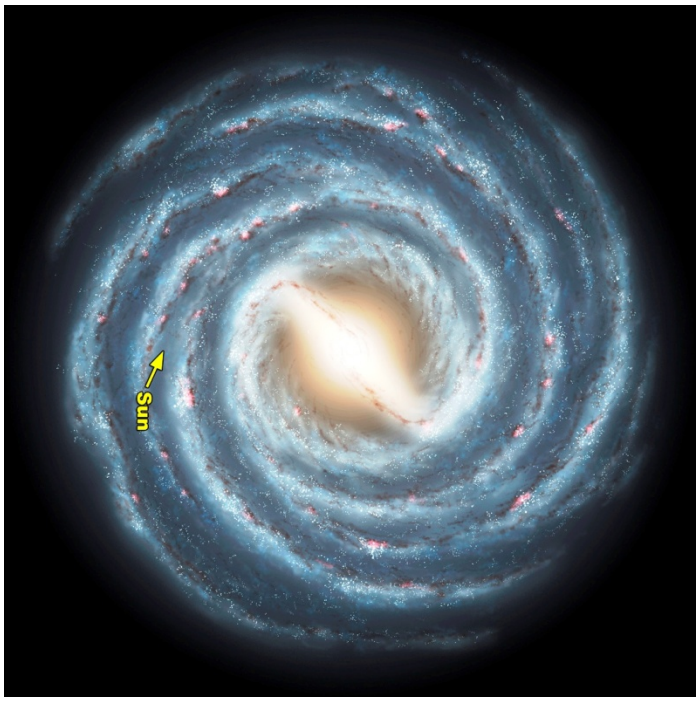


Fig 33

CHAPTER 1 – MATSYA AVATARA OF VISNU



CHAPTER 2 - ORIGIN OF UNIVERSE

CHAPTER 3 – MATSYA IN SANSKRIT LITERATURE

CHAPTER 4 – FISH AND WHALE

CHAPTER 5 – RELEVANCE OF MATSYA WITH WHALE