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STUDIES OF PRIMARY PRODUCTIVITY OF RIVER GODAVARI AT DHANGAR TAKLI TQ. PURNA DIST. PARBHANI (M.S.)

Jayvardhan V. Balkhande
Department of Zoology,
Digambarrao Bindu ACS College, Bhokar Dist. Nanded. (M.S.)
Email: cageculture2014@gmail.com

ABSTRACT :

Primary productivity is the rate at which the Sun's radiant energy is stored by photosynthetic activity of producer organisms in the form of organic substance which can be used as a food material. The primary productivity is thus the basis of whole metabolic cycle in natural aquatic ecosystems.The estimation of primary productivity of an ecosystem is essential to understand its food chains and food web. Hence this work was carried out at DhangarTakli on Godavari river during July 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013.

KEYWORDS : *Productivity, Godavari, DhangarTakli, Purna.*

INTRODUCTION

Primary productivity is the most important biological phenomenon in nature on which the entire diverse array of life depends, either directly or indirectly.Net primary productivity (NPP) is the rate of storage of organic matter in plant tissue in excess of the respiratory utilization by plants during the measurement period***Verma and Srivastava*** **(2015).**Thus, net primary productivity refers to the balance between gross photosynthesis and respiration and other plant losses as death. Primary production in aquatic ecosystems has certain features distinct from that in terrestrial systems**Cebrian*et. al*. (2009).**Energy flow in an ecosystem is an unidirectional process in disparity, The primary productivity is the root of all food chains and food webs of any ecosystem generating 70% atmospheric oxygen of the world.

All the flora and fauna is present in the water body because of the productive water. Light penetration is one of the important parameter as far as productivity is concern. Nowadays many water resources are facing tremendous problems of pollution. The domestic waste, detergent etc play a crucial role in eutrophication. The eutrophication leads to formation of green blanket on the surface of the water body and hence the light cannot penetrate till the bottom. It affects the photosynthesis activity along with the decreasing the productivity of the water body. The productivity of the water body and the fish diversity are related to each other, actually the more productive water is responsible for the good population of flora and fauna.

DhangarTakli is small village situated on the bank of river Godavari and this is undisturbed habitat, back water of Vishnupuri Project is present here till the month of April. Hence more number of aquatic animals found here. Many fishermen of this area doing capture fisheries here for their livelihood. The present study was carried out for three years from July 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013. This was the preliminary work and more work should be necessary to record the exact productivity of this river, because the back water of the Shankar Sagar Reservoir spread 40 KM from the Nanded and between the 40 KM many places the capture fisheries was carried out. If the back water of this project is productive then this will helpful for the maintain of food chain, food web and the entire ecosystem.

MATERIALS AND METHODS

Godavari River is largest river in Maharashtra and flows through Marathwada region. For this study, back water of Shankar Sagar project at DhangarTakli19°7'12"N77°3'28"E was selected.

Estimation of primary production was done by using light and dark bottle method **(Gaarder**and **Gran, 1917; Trivedy**and **Goel, 1986)** and calculated by following formulae such as

Net Primary Productivity,

$$O_2 \text{ mg/L/hr} = \frac{Dl - Di}{h}$$

Gross Primary Productivity,

$$O_2 \text{ mg/L/hr} = \frac{Dl - Dd}{h}$$

Net Primary Productivity,

$$O_2 \text{ mg/L/hr} = \frac{Di - Dd}{h}$$

Where, Di = Dissolved Oxygen in the initial bottle in mg/L.
Dl = Dissolved Oxygen in the light bottle in mg/L.
Dd = Dissolved Oxygen in the dark bottle in mg/L.
h = Duration of exposure in hrs.

RESULTS AND DISCUSSION

The results of the primary productivity, Gross primary productivity and Community respiration for the three yearsJuly 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013 are shown in **Fig. No. 1, 2**&**3** and**Table No. 1**, **2**&**3.**

Net Primary Productivity (NPP)

The Net primary productivity ranged from **0.2 to 2.0 mg/L/hr, 0.1 to 0.7 mg/L/hr** and **0.1 to 1.3 mg/L/hr**for July 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013 respectively.The net primary productivity was minimum in the month of March 2011; the value was **0.2mg/L/hr**whereas it was **3.0 mg/L/hr**maximum during the month of April and May 2011 from July 2010 to June 2011.

For the year July 2011– April 2012 and July 2012– April 2013 the value 0.1 **mg/L/hr**are minimal and are recorded in the month of March 2012 and December 2012 respectively year. The maximum value of NPP was recorded as 0.7 **mg/L/hr and 1.3 mg/L/hr** in the month of July for both years.

Gross Primary Productivity (GPP)

The Gross primary productivity ranged from **0.9 to 4.1 mg/L/hr, 0.6 to 4.0mg/L/hr**and**0.7 to 3.0 mg/L/hr**forJuly 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013 respectively.The maximum value of GPP was recorded **4.1 mg/L/hr, 4.0mg/L/hr**and**3.0 mg/L/hr**in the month of September 2010, September 2011 and July 2012 respectively. Whereas minimum value of GPP was **0.9 mg/L/hr, 0.6 mg/L/hr**and**0.7 mg/L/hr**in the month of November 2010, December 2011 and December 2012 respectively.

Community Respiration (CR)

The Community respiration ranged between**0.1 to 2.8 mg/L/hr, 0.4 to 3.6 mg/L/hr**and **0.6 to 1.7 mg/L/hr**for theJuly 2010 – June 2011, July 2011– April 2012 and July 2012– April 2013 respectively.The community respiration was found maximum in the month of September 2010 as **2.8mg/L/hr.** The minimum value **0.1 mg/L/hr**recorded in the month of February 2011 in the year July 2010 – June 2011.The minimal

community respiration recorded **0.4 mg/L/hr**in the month of December 2011 andthe maximum**3.6 mg/L/hr**in the month ofSeptember 2011in the year July 2011– April 2012.In the year July 2012– April 2013 the highest community respiration recorded **1.7mg/L/hr**in the month of July 2012 and lowest **0.6mg/L/hr**in the month of December 2012.

DISCUSSION

Sreenivasan, (1964) worked on Ayyagulum tank in South India recorded the highest production in June and lowest in December. **Nassar**and**Datta, (1975)** studied on primary production in freshwater ponds and observed the maximum values of primary productivity in November and April while minimum values in January and September. **Sayeeshwari*et al.* (1995)** studied the productivity in Balallake, Bodhan. **Kohli*et al.* (1995)**studied on hydrobiology and fisheries of Powai lake, Bombay observed the maximum primary productivity was in the month of August and minimum values was found in the month of October. **Birasal, (1996)** studied the primary productivity of Supa reservoir, observed minimum values in September and October and maximum in April. The productivity of a lake was influenced by the replenishment of water. **Singh** and **Singh (1999)** studied a comparative study on the phytoplankton primary production of river Ganga and pond of Patna, Bihar and they observed decreases of primary production during winter coincided with less intensity of light and shorter day length.Similar observation reported by**Sreenivasan (1964), SumitraVijayaraghavan, (1971)** and **Ahmad** and **Singh (1987).**

Kanwate (2002) reported gross primary productivity was more than Net primary productivity at Jagtungsagar, Kandhar. The net primary productivity was minimum in the month of November and December. **Vasanthkumar**and**Vijaykumar (2011)** reportedthe GPP between 0.07 to 0.11 gc/m3/hr, the NPP was ranged from 0.037 to 0.050 gc/m3/hr and CR ranged in the range of 0.023 to 0.025 gc/m3/hr in Bhimariver. Low temperatures and light intensities might be limiting the rate of productivity during rainy season. Clear water surface, which permitted more light to penetrate and lower water flow perhaps accounted for the higher values of primary productivity during winter. **Wondie*et al.* (2007)** observed that a large proportion of the annual primary production is realized in one of the four seasons only in a tropical lake. Increased water inflows were highest in the main rainy season. In the monsoon reduced duration and intensity of sunlight and high concentration of silt reducing water transparency and faster movement of water probably limited. **Prabhakar*et al.* (2013).**

During the study period results revealed that GPP, CR are more in the month of September and October month due to clear water surface and more light penetration. These results are similar with**Sreenivasan (1964), SumitraVijayaraghavan, (1971), Ahmad** and **Singh (1987), Singh** and **Singh (1999), Kanwate (2002), Wondie*et al.* (2007)** and**Prabhakar*et al.* (2013).**

Physical, chemical, and biological aspects influence primary productivity directly and the fish production indirectly.Measurement of primary production or photosynthesis is helpful to understand the trophic status and to assess the fish production potential of aquatic ecosystem **(Melack, 1976; McConnel*et al.*, 1977; Oglesby, 1977).**

Conclusion:

The river water quality is depending upon the anthropogenic activities performed in the riveror nearby the river. This may affect the flora and fauna present in it. If the water gets polluted then the productivity of the water body decreases and its direct alter the food chain and food web. Hence proper treatment is necessary to maintain the water quality in the range and it is safe for the living beings present in it.

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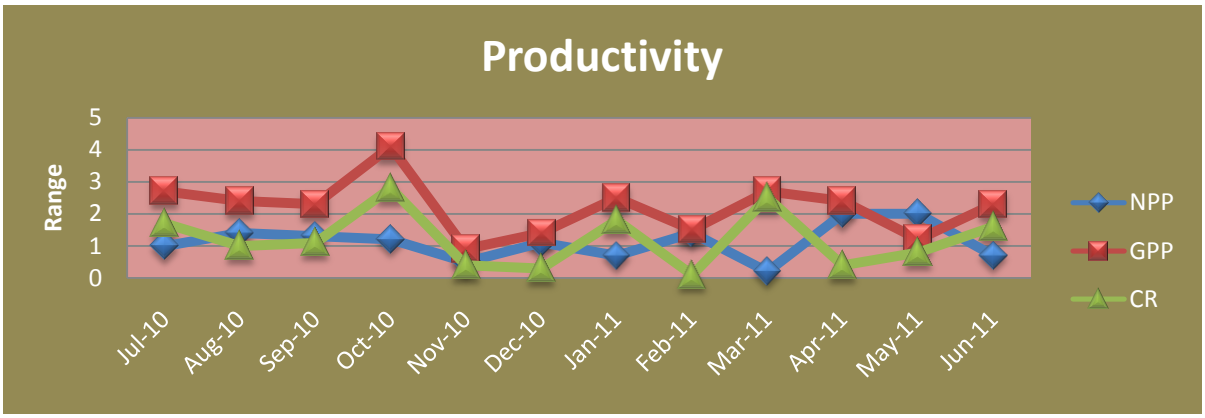

Fig. 1 Productivity (mg/L/hr) ofriver Godavari at DhangarTakli from July 2010- June – 2011.

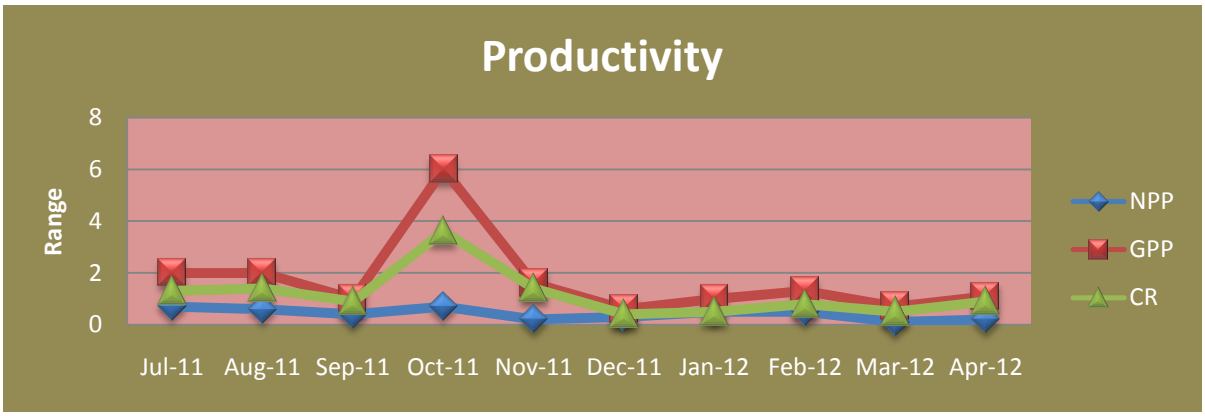

Fig. 2 Productivity (mg/L/hr) ofriver Godavari at DhangarTakli from July 2011- April 2012.

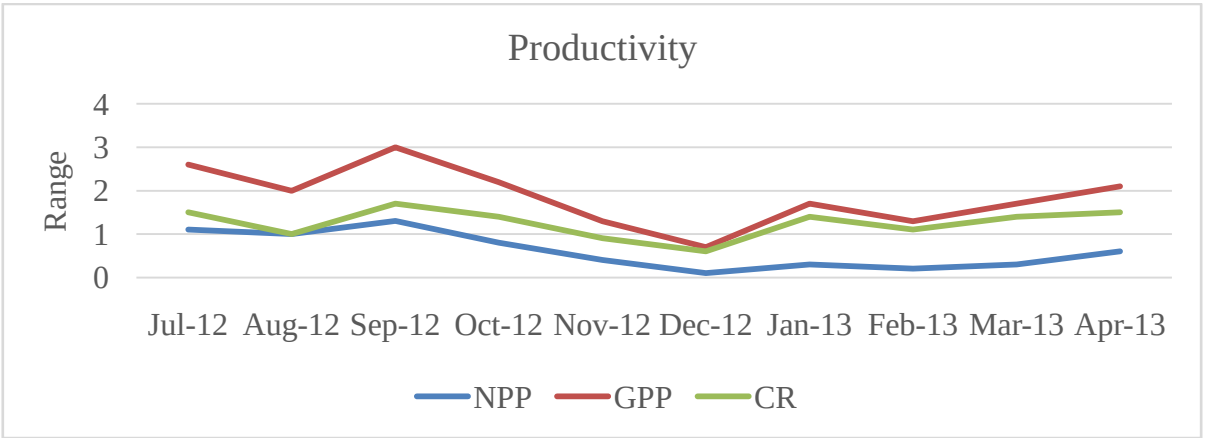

Fig 13.2 Productivity (mg/L/hr) of river Godavari atDhangarTakli from July 2012- April 2013.

Months	NPP in **mg/L/hr**	GPP **mg/L/hr**	CR **mg/L/hr**
Jul-10	1	2.7	1.7
Aug-10	1.4	2.4	1
Sep-10	1.3	2.3	1.1
Oct-10	1.2	4.1	2.8
Nov-10	0.5	0.9	0.4

Dec-10	1.1	1.4	0.3
Jan-11	0.7	2.5	1.8
Feb-11	1.4	1.5	0.1
Mar-11	0.2	2.7	2.5
Apr-11	2	2.4	0.4
May-11	2	1.2	0.8
Jun-11	0.7	2.3	1.6

Table No. 1 Productivity (mg/L/hr) of river Godavari at DhangarTakli from July 2010 to June 2011.

Months	NPP in **mg/L/hr**	GPP **mg/L/hr**	C R **mg/L/hr**
Jul-11	0.7	2	1.3
Aug-11	0.6	2	1.4
Sep-11	0.4	1	0.9
Oct-11	0.7	6	3.6
Nov-11	0.2	1.6	1.4
Dec-11	0.3	0.6	0.4
Jan-12	0.5	1	0.5
Feb-12	0.5	1.3	0.8
Mar-12	0.1	0.7	0.5
Apr-12	0.2	1.1	0.9

Table No. 2 Productivity (mg/L/hr) of river Godavari at DhangarTakli from July 2011 to April 2011.

Months	NPP in **mg/L/hr**	GPP **mg/L/hr**	C R **mg/L/hr**
Jul-12	1.1	2.6	1.5
Aug-12	1	2	1
Sep-12	1.3	3	1.7
Oct-12	0.8	2.2	1.4
Nov-12	0.4	1.3	0.9
Dec-12	0.1	0.7	0.6
Jan-13	0.3	1.7	1.4
Feb-13	0.2	1.3	1.1
Mar-13	0.3	1.7	1.4
Apr-13	0.6	2.1	1.5

Table No. 3 Productivity (mg/L/hr) of river Godavari at DhangarTakli from July 2012 to April 2013.

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