Journal of Basics and Applied Sciences Research (JOBASR)
ISSN print: 3026-9091
Volume 2(1) March 2024
DOI: https://doi.org/10.33003/jobasr-2024-v2i1-31

Prevalence of Ecto-Parasitic Fauna in Silver Catfish (*Bagrusbajad*) from Zobe Reservoir, Katsina State

Bako, H. Y.*, Sadauki, M. A .and Maikudi, A. A.
Department of Fisheries and Aquaculture, Faculty of Natural Renewable Resources, Federal University, Dutsin-Ma, Katsina State, Nigeria.
*Corresponding Author Email: hbako@fudutsinma.edu.ng

ABSTRACT
Fish parasitic infections inflict a most importanteconomic concern on fish farming industries. Helminthic infestations can cause a variety of fitness difficulties as well as economic sufferings for fishing populations. Prevalence of ecto-parasites fauna in silver catfish *Bagrusbayad* from Zobe reservoir, Katsina Nigeriawas inspected to comprehend the healthiness conditionof the fish, possibledanger to their existence as well asprotection of consumption of fish from the water body.The current study was undertaken between August and October, 2023 to determine the prevalence of fish ecto-parasites of *Bagrusbajad* and the associated risk factors in Zobereservoir Dutsin-Ma, Katsina State, Nigeria. A total number of108 fish samples were collected and examined from Zobe reservoir. The fish was identified as well as separated based on their sex before being transferred live to the Fish Biology laboratory, Federal University Dutsin-Ma, Katsina State for additional evaluation. Out of 108 fish samples from Zobe, 88 were male and 20 were female. Fish parasites recovered and their prevalence among *Bagrusbajad* obtained from Zobe reservoir includes; *Tricodina*spp 17 (68%), and *Gyrodactylus*spp 8 (32%). The prevalence of parasites recovered from the fish species in this study was low. In conclusion, *Bagrusbajad* from Zobe reservoir were infected by parasites that are of economic importance. The findings suggest that the observed parasitic infections may adversely affect *Bagrusbajad* and if not well managed, could also infect human beings who consume the fish. It is therefore recommended that communities along the reservoir should desist from activities likely to increase parasite load, also, the part organs of harvested fishes from the study area should be discarded rather than consume to prevent zoonotic diseases.

Keywords:
Prevalence,
Bagrusbajad,
Ectoparasite,
Zobe Reservoir.

INTRODUCTION

Parasitic worms present a widespread and significant challenge to freshwater fish populations (Sadauki *et al.*, 2023b). It is estimated that approximately 30,000 species of helminths, or worms, act as parasites of fishes, many of which pose serious threats to their hosts. Helminths are a diverse group of worm-like parasites known to cause infections and diseases in fish across both freshwater and marine environments (Jyrwa *et al.*, 2016; Hazarika and Bordoloi, 2022). Fish serve as hosts to a broad array of parasites, predominantly falling into four groups: trematodes, cestodes, nematodes, and acanthocephalans. According to the World Health Organization (WHO), the global population currently affected by fish-borne trematodes alone surpasses 18 million, with many more individuals at risk, particularly those who consume raw, lightly smoked, lightly salted, dried, or pickled fish (Jyrwa*et al.*, 2016; Hazarika and Bordoloi, 2022). The prevalence of fish diseases resulting from helminthic infestations has emerged as a significant obstacle in aquaculture.It disrupts the typical health status of fish, leading to fish mortality and resulting in significant economic losses for fisheries (Hazarika and Bordoloi, 2022). The parasite communities found in freshwater fish are crucial elements of biodiversity, offering insights into environmental conditions such as water quality. Moreover, they play a role in shaping ecosystem productivity and food webs (Lehun *et al.*, 2022). Therefore, investigations into the parasite communities of wild fish can provide valuable insights into how these relationships between parasites, hosts, and the environment respond to ecological factors such as host diet, environmental conditions, presence of infective stages in the ecosystem, and annual and seasonal variations (Lima *et al.*, 2023), as well as the strategies employed by different parasite taxa in relation to these factors.In regions with temperate climates, factors like water temperature and thebehaviourof wild fish populations are known to significantly influence the dynamics of parasite infections (Schade *et al.*, 2016; Yang *et al.*, 2016; Lima *et al.*, 2023). Many aquatic invertebrates in these areas can serve as potential intermediate, paratenic, or definitive hosts for fish. These conditions differ from those in tropical regions, where aquatic ecosystems lack extreme temperatures that may fluctuate throughout the year. Both abiotic and biotic factors in the environment can contribute to temporal and seasonal variations in the structure of parasite communities within wild fish populations. Studies have demonstrated that wild fish populations in the Amazon basin exhibit fluctuations in their parasite communities based on temporal and seasonal patterns (Lima *et al.*, 2023).

Research has indicated that both rainy and dry seasons can impact the behaviour of host fish, as well as the diversity of parasites and invertebrates in ecosystems. Thus, it is crucial to identify the factors influencing the composition of parasite communities to enhance our understanding of host fish parasite ecology. Many fish species are known to host various parasites such as protozoa and parasitic helminths, which play significant roles in aquatic ecosystem dynamics. Fish, like other protein-rich animals, are susceptible to a range of microorganism attacks (Ashade*et al.*, 2013). Parasitic infestations in fish are widespread in tropical regions (Soliman and Nasr, 2015), with different parasites associated with various fish species. Tropical freshwater fish species like *T. zillii*, *C. gariepinus*, *B. domac*, and *B. bayad* serve as definitive, transport, or intermediate hosts in the life cycle of numerous protozoan, metazoan, and crustacean parasites (Ashade*et al.*, 2013). Considering the significance of aquaculture as a livelihood source for many people in north-western Nigeria and the economic repercussions of fish diseases, this study investigated the common ectoparasites found on *Bagrusbayad* in Zobe Reservoir in Dutsin-Ma, Katsina State, Nigeria.

MATERIALS AND METHODS

Study Area

Zobe Artificial Lake is located in Dutsin-Ma LGA of Katsina State, Nigeria, between 12°20′34.62″N and 12°23′27.48″N and 7°27′57.12″E and 7°34′47,68″E. It has a land area of around 968,544 km2. The Zobe artificial lake is formed by two major rivers: the Gada and the Karaduwa. The Zobe artificial lake on the River Karaduwa had a total length of around 7 km and an area of approximately 4,500 hectares, with an annual rainfall of 600 to 700 mm and an annual average temperature of approximately 25°C. For this study, three (3) major sites nearby the reservoir were wisely selected: Site A, Site B, and Site C. (Sadauki *et al.*, 2022b).

Sample collection

Fish samples were collected over 3 months in the selected study area. Six samples were collected from three different sampling locations (location A, location B, and location C). Location A is located at the entrance to the artificial lake (reservoir) in the Karaduwa River canal somewhere fishing activity is going on, Location B is located in the centre of the lake/dam somewhere human beingsdoing other than rain farming and dry farming are minimal, as well as Location C is located at the end of a lake where agricultural, dry farming as well as many fishing activity take place. Alive/live experimental fish samples were conveyed in 25 litre plastic containers, mostly filled with water, to the Department of Biology, Federal University of Dutsin-Ma, Katsina State, for proof of identity andmorphometric assessment, before parasites inspection, gathering and detection as describe by (Sadauki *et al.*, 2023a).

Identification of samples*Bagrusbayad*

Immediately on the field, fish wereidentified using the freshwater fish identification guide by Olaosebikan and Raji, (2013).

Sexing of experimental fish

The sexes of the fishes were determined by physical examination of the external features of the fish samples (urogenital system), where males were characterized by protruded and elongated genital papilla and the female with round opening papilla as described by as describe by (Sadauki *et al.*, 2023a).

Measurement of experimental fish

The standard lengths (cm) were measured using a meter rule and the weight were measured using top loading sensitive weighing balance using standard techniques as described by as describe by (Sadauki *et al.*, 2023a).

Examination of samples for Ecto-parasites fauna

The examination of freshly euthanized fish specimens involved a thorough inspection of their external body surfaces, encompassing scales, gills, fins, and gill opercula, to detect ectoparasites and associated parasitological features. A hand lens (pointer) was utilized to promptly identify ectoparasites on the skin andfins of the sampled fish. The skin was also scrutinizedfor the presence of capsules containing fluke *metacercariae*, identified as dark spots, as well as yellowish sores/cysts. These were excised from the skin for further examination. To collect samples for microscopic analysis, scrapings from the head regionand ventral area of the fish, extending from the head to just after the anal point and including the fins, were obtained by scratching the fish membrane with a cover slip. The slime obtained from this process was then spread on a fresh light microscope slide, with a dropletof normal saline added for optimal visualization. Samples were later sheltered with coverslips as well as observed below a light microscope at 100x and 400x intensification. The ectopart gills were inspected in situ for the occurrence of macroparasitesand separated/removed in addition to positioned in Petri dishes comprising regular fishpond water. The gill rakes were separated using tweezers and examined for the presence of worms using a stereomicroscope (Sadauki*et al.,* 2023b).

Identification of Parasitic fauna

Parasite identification was performed by examining the body shape and morphological features of the collected samples and comparing them with those described in the study of Florio *et al.* (2009) and Wu (1995). The modified key of Paperna (1996) was used to identify the main classification of parasite mature and larvae in the studied fish.

Parasite Prevalence and Intensity Estimation

The prevalence of parasitic worm infestation was calculated for sex, location, length and weight using the model described by Sadauki *et al.*(2022a):

$$\text{Prévalence (\%)} = \frac{No of fish host infected x100}{\text{Total no.of fish host Examined}} \quad (1)$$

$$\text{Percentage of infection (\%)} = \frac{Number\ of\ a\ specific\ parasite\ in\ the\ sample \times 100}{Total\ number\ of\ parasies\ in\ the\ sample} \quad (2)$$

Data Analysis

The occurrence and severity of infestation were presented in percentage terms. Descriptive statistics, conveyed through frequencies and percentages, were utilized to explore the relationship between risk factors and the prevalence of parasites. P values were calculated for all analyses.

RESULTS AND DISCUSSION

A total of (108) experimental obtained from Zobe reservoir, 88 were males and 20 were females. Male sample fish had a moderately higher amount of infections 15 (17.04%) whereas female sample fish of silver catfish had a lower rate of infection 10 (50.00%) as revealed in Table 1.

Table 1: Prevalence of Ecto-parasites in Relative to Category of Sex

Sex	Number examined	Number infected	Prevalence (%)
Male	88	15	17.04
Female	20	10	50.00
Total	**108**	**25**	**23.15**

Among theSilver catfish experimented obtained from Zobe Reservoir. A total number of 25 parasitic worms were obtained in the sampled fishes inspected, out of which *Gyrodactylusspp*were 8 (32.00%), and *Trichodinaspp* had 17 (68.00%) as the highest parasitic infestation.

Table 2: Prevalence of Ecto-parasites in relation to Texa of parasites

Parasites	Texa group	No of parasites	Prevalence (%)
Trichodinaspp	Protozoans	17	68.00
Gyrodactylusspp	Monogeans	8	32.00
Total		**25**	**100%**

No individuals were infected with *Trichodinaspp* and *Gyrodactylusspp* on the skin as shown in table 3.*Trichodinaspp*infested 21samples (84.00%) in the gills while*Gyrodactylusspp* 4 (16.00) .

Table 3: Prevalence of Ecto-parasites in sites of infections

Parasites	Skin	Gills
Trichodina spp	0	21(84.00)
Gyrodactylus Spp	0	4(16.00)
Total	**0(0.0%)**	**25(100%)**

Among the 108 experimental samples gotten and checked from three (3) dissimilar location in Zobe reservoir, the entire incidence of 25 (23.15%) was acknowledged (Table 4). In incidence between experimental samples gotten from the 3 sample locations, *Bagrusbayad* obtained from sample C 11 (30.55%) harbored the reasonably highest amount of parasitic fauna, followed by sample B 9 (25.00%), however those investigated samples from sample A location had the smaller proportion of infestation 5 (13.88%).

Table 4*:* Prevalence of Ecto-parasites in Comparative to Sample Site

Locations	Number examined	Number Infected	Prevalence (%)
SITE A	36	5	13.88
SITE B	36	9	25.00
SITE C	36	11	30.55
TOTAL	**108**	**25**	**23.15**

Experimental samples fish obtained from Zobe indicated that Silver catfish *Bagrus bayad* with a length of 35.1-40.0cm harboured more parasites 9 (22.50%), followed by 20.1-25.0cm 7 (33.33), followed by 5 (26.31), then followed by 26.1-30.0cm 4(20.00%) and lastly followed by the lesser one with 0 (0.0%) infection (Table 5).

Table 5: Prevalence of Ecto-parasites in Comparative to Length of Fish

Fish length (cm)	Number examined	Number Infected	Prevalence (%)
15.1-20.0	8	0	0.00
20.1-25.0	21	7	33.33
26.1-30.0	20	4	20.00
31.1-35.0	19	5	26.31
35.1-40.0	40	9	22.50
TOTAL	**108**	**25**	**23.15**

Experimental fish samples gotten in Zobe showed that Silver catfish *Bagrusbayad* with a weight of 161-200g harboured more worms 10 (15.15%) shadowed by 131-160g 9 worms (60.00%), followed by 91-130g 3 (17.64%), and thenfinallyshadowed by the lesser ones 50-90g 3 (30.00%) (Table 6).

Table 6: Prevalence of Ecto-parasites with Weight

Fish length (cm)	Number examined	Number Infected	Prevalence (%)
50-90	10	3	30.00
91.130	17	3	17.64
131-160	15	9	60.00
161-200	66	10	15.15
TOTAL	**108**	**25**	**23.15**

Discussion

Remarkable is the fishes ‘susceptibility to parasiticinfestation. An observation that depends on species of fish and type of water inhabited as well as certain water quality parameters such as dissolved oxygen content, increased organic matter content, etc. Poor ecological situations also increase fish weakness/vulnerability to (Nababa*et al.*, 2023).Nababa*et al*. (2023) mentioned that parasitism differs in many water ecosystems, and the connection between biotic and abiotic factors determines this. Fish species in healthy environmental situations scarcely come down with sicknesses or infections. Abiotic factors such as increased water temperature may change the resistant status of fish supporting infection and parasite setting up. ÁlvarezPeritero*et al*. (2012) have shown that poor environmental conditions can influence the presence of parasites. Parasites have attracted increasing interest among parasite ecologists as biological indicators of environmental pollution due to human activities due to their diverse responses to such anthropogenic pollution (Sadauki *et al.*, 2023b).This findings goes in agreement with the opinion of Kawe*et al.*, (2016) who exposed that the environs is identified to act a important task in parasitic worms occurrence. In this survey, the occurrence differed from one place to the other, with sample sites C having a extreme higher occurrence, and dissimilar other parameters, there is a important association concerning the occurrence of external helm in thes as well as the experimenting site. This influence be a effect of actions and contamination status of the locations. Variances in the incidence of invasion at dissimilarsites (locations) have been recognized to numerous influences such as endemicity, approachability of intermediary hosts as well asweak point of the host to infestation (Ogonna*et al.,* 2017). Additional, the unhealthy practices amongst water operatorssupport the infection of fish by helminthes (Ani*et al.,* 2015; Ani*et al.,* 2016).This observation is similar to the finding documented by previous researchers (Sadauki*et al.*,2022a; Sadauki*et al.*,2022b), who stated higher prevalence in dissimilar samples location. The results obtained from this survey revealed that protozoans and monogeans are the ecto-parasites observed in this *Bagrusbayad* from Zobe reservoir, Dutsin-Ma, Katsina, Nigeria.The protozoans are *trichodinaspp*and monogeans are *gyrodactylus spp.*This findings displays that the parasitic protozoan *Trichodina species* can be found in three study samples area. In aforementioned information, *Trichodina spp*. It has been documented in fishes rear in enclosures, fishponds, as well as natural waters in Kenya, Uganda, and Ethiopia in addition to Nigeria (Florio *et al.*,2009; Mitiku*et al.,* 2018;Sadauki*et al.*,2023b).Fish actions may place them at risk for easy transmission of parasites between invertebrates and fish intermediate hosts.Monogeneans had a direct lifecycle with no intermediary hosts as well as are host and size particular during their range(Sadauki *et al.*, 2023b).Sadauki *et al.* (2023b.) report that monogeneans could be alive on the skin, scales, fins, lip folds, nases, branchiostegal tissues an d gills of their fish (host).In the present investigation, anoverall incidence of fish parasites was observed to be 23.15%. This finding disagree with a previous study that reported a prevalence rate of 50.92% in the Dutsin-Ma area.In this study, the comprehensive prevalence of external parasites was determined to be 23.15%. Notably, *Trichodinaspp*. (68.00%) and *Gyrodactylus spp*. (32.00%) emerged as the most significant ecto-parasitic worms identified in these findings. This observation is consistent with the findings of Tadesse (2009); Areda *et al.* (2019) and Sadauki *et al.* (2023b), who similarly reported the highest incidence of *Trichodina spp*. in cultured systems at Yemlo and Wonji fish ponds, with prevalence rates of 56.67% and 46.70%, respectively. Additionally, a comparable occurrence of 34.6% for *Trichodina spp*. was documented in Uganda (Florio *et al.*, 2009).

CONCLUSION

Protozoans,as well asmonogeanes, were detected to be the highly predominant categories of parasites in fish species *B. Bayad* as well as the inspection revealed that Protozoan shelminthic had a larger load than monogeans. The incidence of parasitic worms invasion were discovered to be associated with fish weight as well as length, with larger and weightier fish exhibiting a highest sensitivity to helminthic infestation. The incidence of parasitic worm in the Zobe reservoir were likewise associated to environmental conditions, including in what way agriculturalists place of their leftover and faeces.

REFERENCES

Alvarez-Pellitero P. (2012). Fish Parasites. Part 1: Parasites of continental fish of the Duero basin (NW Spain); An approach to aspects of the host parasite relationships. LAP Lambert Academic Publishing, Germany

Ani, O. C. Nnamonu, E. I. Onwe, S. O. (2015).Helminthiasis among Rural School Children of Amofia-Ngbo Community in Ebonyi State, Nigeria. *Journal Pharma and BiologiSci* 10(4), 69-72 .

Ani, O. C. Nnamani, C. V. Nnamonu, E. I. Oduburu,C. J. Martins, P. E. (2016). Phylloplane Parasites on Common Edible Plants of Eastern Nigeria: Easy Link to Intestinal Parasites Transmission. *International Journal Tropic Disease & Health* 13(1), 1-5.

Areda, T. A., Mitiku, M. A, Woldearegay, Y. H., Teklu, A. and Getachew, S. (2019).Prevalence of major parasites of Nile tilapia (*Oreochromisniloticus*) in south west Showa zone selected fish farms, Oromiaregion. *Ethiopia International Journal of Fisheries and Aquatic Studies*, 7(3): 165-170.

Ashade OO, Osineye OM, KumoyeEA(2013).Isolation, identification and the prevalence of parasites on Orechromisniloticusfrom three selected river systems. J Fish AquatSci 2013; 8: 115-21.

Barber, I., D. Hoare and J. Krause (2020). Effects of parasites on fish behaviour: a review and evolutionary perspective. Reviews in Fish Biology and Fisheries 10(2): 131–165.

Florio, D., Gustinelli, A., Caffara, M., Turci, F., Quaglio, F., Konecny, R. and Matolla, G. K., 2009.Veterinary and public health aspects in tilapia (Oreochromisniloticus) aquaculture in Kenya, Uganda and Ethiopia.Ittiopatologia, 6, 51-93.
gastrointestinalhelminth parasites of *Clarias gariepinus* in Abuja, Nigeria. Sokoto Journal of Veterinary Sciences 14(2), 26-33.

Hazarika, A.K. and B. Bordoloi (2022).Ichthyo-parasitological studies in northeastern India. Journal of Threatened Taxa14(5): 21019–21024. https://doi. org/10.11609/jot.7583.14.5.21019-21024

Imam, T. S. and Dewu, R. A. (2010).Survey of Piscine ecto and intestinal parasites of *Clarias sp.*sold at Galadima road fish market, Kano metropolis, Nigeria.*Bioscience Research Communication*, **22** (4):209.

Jyrwa, D.B., S. Thapa and V. Tandon (2016).Helminth parasite spectrum of fshes in Meghalaya, northeast India: a checklist. *Journal of ParasitcDiseases*40(2): 312–329.

Kawe, S.M. God'spower, R.O. Balarabe, M.R. andAkaniru R.I (2016). Prevalence of

Lehun AL, Cavalcanti LD, Lizama MAP, Silva JOS, Casali GP, Takemoto RM.(2022). Temporal effects and changes in the parasitic community of Prochiloduslineatus(Valenciennes, 1837) (Characiformes: Prochilodontidae) in a floodplain. J Helminthol2022; 96: e4. http://dx.doi.org/10.1017/S0022149X21000742.PMid:34991737

Lima ES, Oliveira MSB, Tavares-Dias M.(2022). Temporal and seasonal variation of metazoan parasites in Pimelodusornatus(Siluriformes: Pimelodidae) from the Amazon River, Brazil. Parasitol Res; 121(11): 3171-3181. http://dx.doi.org/10.1007/s00436-022-07637-x.PMid:36040631 .

Lima ES, Santos CBR, Tavares-Dias M.(2023). Metazoan parasites in Colomesusasellus(Pisces: Tetraodontidae) from Amazon River, in Brazil: an ecological, annual and seasonal study. J Nat Hist; 57(13-16): 885-903. http://dx.doi.org/10.1080/00222933.2023.2220173.

Mitiku, M. A., Konecny, R.and Haile, A. L. (2018). Parasites of Nile tilapia (*Oreochromisniloticus*) from selected fish farms and Lake Koftuin central Ethiopia Mitikuetal.,*Ethiopian Veterinary Journal*, 22 (2): 65-80 DOI https://dx.doi.org/10.4314/evj.v22i2.6

Nababa, A. S., Umaru, J., Sadauki, M. A., & Sadauki, A. (2023). Assessment of Gastrointestinal Parasite in Silver Catfish (Bagrusbayad; Forskal, 1775) from Ajiwa Reservoir Katsina State, Nigeria. UMYU Scientifica, 2(4), 195 – 200. https://doi.org/10.56919/usci.2324.024

Ogonna, C. A. Emmanuel, I. N. and Cynthia, E. (2017). Prevalence of Intestinal Parasites of Fish Farmed and Harvested in Abakiliki, Nigeria: A Pointer to the Level of their Vulnerability. *International Journal of Research in Pharmacy and Biosciences* 4, 7-10.

Paperna I. Parasites, infections and diseases of fishes in Africa-an update. CLFA technical paper.FAO, Rome, 1996, 31.

Paperna, I., 1996. Parasites, infections and diseases of fishes in Africa: An update.

Sadauki, M. A., Auta, T. and Ibrahim, J. (2023b). A Survey of Ecto-Parasites in *Oreochromisniloticus* (Linnaeus, 1758) (Nile Tilapia) in Zobe Reservoir, Katsina State. *Sahel Journal of Life Sciences* FUDMA, 1(1): 1-7. DOI: https://doi.org/10.33003/sajols-2023-0101-001

Sadauki, M. A., Dauda, A. B., and Yusuf, M. A. (2022a).Prevalence of gastrointestinal helminths of African catfish (*Clarias gariepinus* Burchell 1822) in zobe reservoir, katsina state, Nigeria. FudmaJournal of Agriculture and agricultural technology, 8(1), 123-130.

Sadauki, M.A, Bawa, S.B. and Umar, J .(2022b). Studies on parasitic infestation and prevalence in *Clarias gariepinus* (Burchell, 1822) from Zobe reservoir, Katsina State, Nigeria. *Nigerian J. Anim. Sci*. 2022, 24 (1): 100-107

Sadauki, M.A, Bichi,A. H. and T. Auta.(2023a).Comparative Survey of Parasites of African Catfish Clarias gariepinus in Ajiwa and Zobe Reservoirs in North-Western Nigeria.*Asian Journal of Fisheries and Aquatic Research*.Volume 22, Issue 2, Page 25-32, 2023; Article no.AJFAR.98156ISSN: 2582-3760

Schade FM, Raupach MJ, Wegner KM.(2016). Seasonal variation in parasite infection patterns of marine fish species from the Northern Wadden Sea in relation to interannual temperature fluctuations. *Jour. Sea Res*; 113: 73-84. http://dx.doi.org/10.1016/j.seares.2015.09.002.

Soliman, N.F., and Nasr, S.M. (2015) Metal contents in common edible fish species and evaluation of potential health risks to consumers. *Journal of Coastal Life Medicine* 3 (12): 956-961.

Tadesse B. (2009). Prevalence and abundance of fish parasites in BOMOSA cage systemsand Lakes Babogaya and Awasse, Ethiopia. Thesis (M. Sc.), the Netherlands.

Woo, P.T.K., 1995. Fish disease and disorder: Protozoan and Metazoan Infection volume1. CABI international, walling ford, UK.Pp. 45- 46.

Yang BJ, Zou H, Zhou S, Wu SG, Wang GT, Li WX.(2016).Seasonal dynamics and spatial distribution of the *Dactylogyrus*species on the gills of grass carp (*Ctenopharyngodonidellus)* from a fish pond in Wuhan, China. *J Parasitol*; 102(5): 507-51