

Prevalence and intensity of protozoan ectoparasite of the white leg shrimp (*penaeus indicus*) in Helleh site, South of Iran

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Abstract

Development of shrimp farming has been associated with the incidence of fatal diseases including viral, bacterial and protozoan parasites of shrimp. Our study was aimed to present a status of several important protozoan parasites of *Litopenaeus vannamei* in cultured earthen ponds in Iran during the period of 2011-12. One hundred live shrimp were randomly prepared from the Shrimp Helleh Station in south of Iran. Prevalence and intensity were two important indices that calculated in our research. They were scraping, putting on clean slides and examined under microscope to observe the protozoan parasites. *Zoothamnium* sp. is more prevalent pathogen among *Peritrichous ciliates* (79 to 88) in pleopods. *Acineta* sp. was less prevalent in our isolations neither in pleopods nor in gills. It was concluded that, *Peritrichous ciliates* are more frequent ciliates causing mortality in cultured shrimps at high density in higher temperature and ammonia.

Keywords: *Penaeus indicus* , protozoan, epibiont ciliates, epicommensal.

Introduction

In recent decades, Development of shrimp farming has been associated with the incidence of fatal diseases including viral, bacterial and protozoan parasites of shrimp (Lightner 1996). Therefore, shrimp farmers have been suffering from losing the production (Afsharnasab 2012; Kakoolaki, Sharifpour,

Sharifrohani, Ebrahimzadeh Mousavi, Afsharnasab, Hoghoughirad, Dashtiannasab & Nezamabadi 2013). Shrimp production in Iran is not exempt from these global fluctuations. When shrimp production in 2007 fell by half, the farmers shifted the cultured species from *Fenneropenaeus indicus* to *Litopenaeus vannamei* to reach 20,000 tons in 2013 as highest record (Kakoolaki et al. 2013). The exoskeleton of crustaceans provides suitable organic substrates for many species of epibiont ciliates, especially suctorians, chonotrichs, and peritrichs (Mayen-Estrada R. & Aladro-Lubel M. A. 2002).

Some researchers have reported *Peritrichous ciliates* parasites such as *Zoothamnium* sp., *Epistylis* sp., *Acineta* sp. and *Vorticella* sp. in which exoskeleton are the target tissue (Jalali Jafari 1990; Kakoolaki 1997; Tamjidi 1995). Protozoan parasites and commensals occur both inside and outside the host body. *Zoothamnium* sp. and *Vorticella* sp. are ecto-parasites and gregarines is endo-parasite (Chakraborti & Bandyapadhyay 2011). Quantity of Peritrichs can rapidly increase, attach and feed on the exoskeleton and gill tissues due to poor quality of either earthen or hatchery pond water (Jalali Jafari 1990; Kakoolaki 1997). Overstreet (1973) showed that there is a putative relationship between the epibiont ciliate, *Zoothamnium* sp. and mortality of shrimp following stress. Their abundant presence can interfere with the breathing and mobility of the host (Jayasree, Janakiram & Madhavi 2001). *Zoothamnium* sp. are at their peak during climate change and increasing the concentration of nitrite or nitrate and can be controlled by salinity changes or habitat (Jayasree et al. 2001).

Zoothamnium is a frequent inhabitant of the gill surfaces of shrimp in ponds with low oxygen content and heavily infested shrimp can suffocate. Sur-

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Table 1 Cross tabulation between weight groups and *Zoothamnium* sp. observed on pleopods and gills.

		Pleopod <i>Zoothamnium</i> sp.			Total	
		Severe	moderate	mild		
Weight grouping	1	Count	9	8	7	24
		% of Total	25.0%	22.2%	19.4%	66.7%
2	Count	9	3	0	12	
	% of Total	25.0%	8.3%	.0%	33.3%	
Total	Count	18	11	7	36	
	% of Total	50.0%	30.6%	19.4%	100.0%	

Table 2 Cross tabulation between *Epistylis* sp. in Pleopod groups and *Epistylis* sp. observed in Gills.

			<i>Epistylis</i> in Gills		Total
			3	4	
<i>Epistylis</i> in Pleopods	1	Count	9	5	14
		% of Total	25.0%	13.9%	38.9%
	2	Count	8	3	11
		% of Total	22.2%	8.3%	30.6%
	3	Count	2	9	11
		% of Total	5.6%	25.0%	30.6%
Total	Count	19	17	36	
	% of Total	52.8%	47.2%	100.0%	

Table 3 Cross tabulation between *Zoothamnium* sp. in Pleopod severity groups and *Acineta* sp. severity groups observed in Gills.

			<i>Acineta</i> in gills		Total
			3	4	
<i>Zoothamnium</i> in Pleopods	Severe	Count	1	17	18
		% of Total	2.8%	47.2%	50.0%
	moderate	Count	2	9	11
		% of Total	5.6%	25.0%	30.6%
	weak	Count	3	4	7
		% of Total	8.3%	11.1%	19.4%
Total		Count	6	30	36
		% of Total	16.7%	83.3%	100.0%

and *Acineta* sp. in gills are given as follows:

$P(\text{Zoothamnium sp.}) = 12 / 100 \times 100$, $P = 12\%$ (n: 100)

$P(\text{Epistylis sp.}) = 7 / 100 \times 100$, $P = 7\%$ (n: 100)

$P(\text{Acineta sp.}) = 5 / 100 \times 100$, $P = 5\%$ (n: 100)

The figures of common and non-common *peritrichous ciliates* observed in shrimp are given as Tables 1-6. Whole figures show a common stalk for attaching to the host tissue.

Discussion

Our study was aimed to identify the ecto-parasite

species and determined the prevalence and intensity of the infection in *Litopenaeus vannamei* cultured in Iran. According to the results obtained, the prevalence of *Zoothamnium* sp. was higher in comparison to *Acineta* sp. or *Epistylis* sp. In the other view, the *peritrichous ciliates* were more common in pleopods but gills. It seems shrimp with lesser weights were more susceptible to *Zoothamnium* sp. but no significant difference was observed between severities across the groups (Table 1).

According to the results of prevalences (Fig. 3), *Acineta* sp. was less prevalent in our isolations neither in pleopods nor in gills. Based on Table 2, there



Figure 1 It shows 3 *Zoothamnium* with 3 individual stalks and 1 common stalk to attach to host tissue; wet mount, $\times 400$.



Figure 2 It shows *Epistylis* with a common stalk to attach to host tissue; wet mount, $\times 400$.

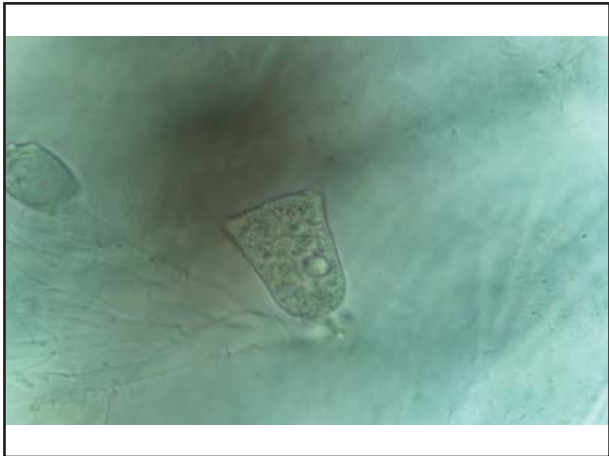


Figure 3 *Acineta* attached to a host tissue; wet mount, $\times 400$.

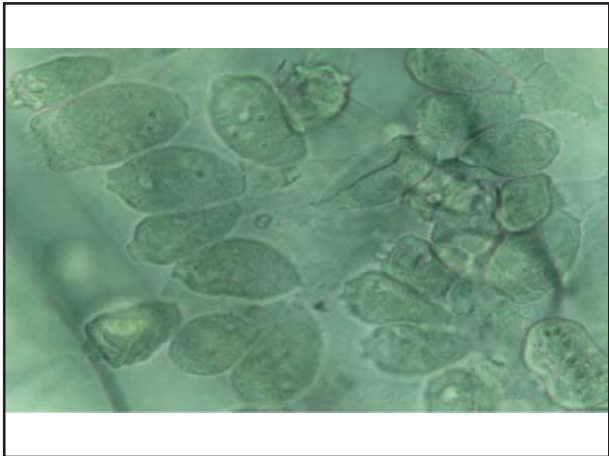


Figure 4 Intensity of attached different parasites to shrimp gill; wet mount, $\times 400$.

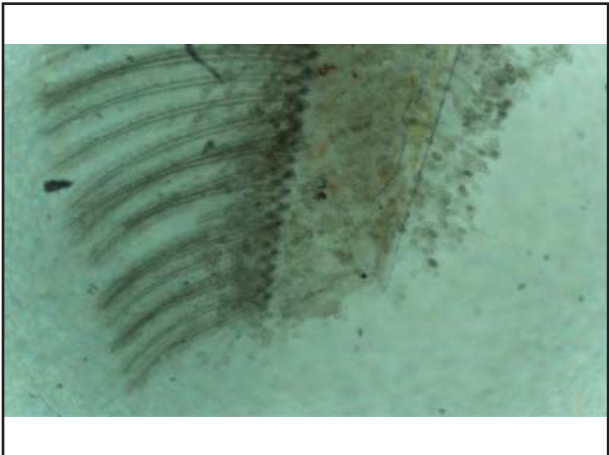


Figure 5 Intensity of attached different parasites to shrimp gill; wet mount, $\times 40$.

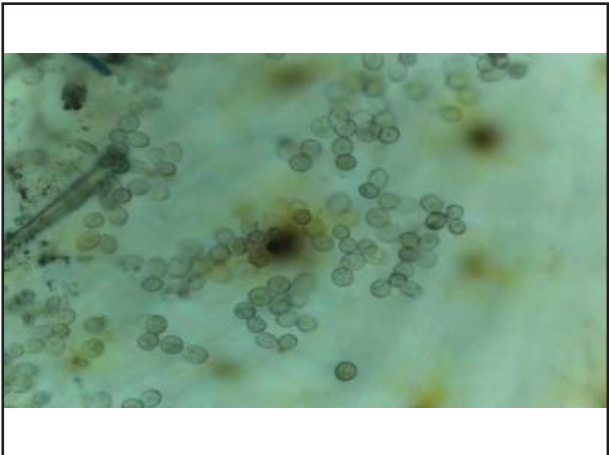


Figure 6 Intensity of attached different parasites to shrimp pleopods; wet mount, $\times 100$.

is a matched trend between the severity of *Zoothamnium* sp. in pleopods and gills so that while increasing of the infection became more in pleopods, an increasing trend of the parasite incidence also was

observed in gills. On the other hand, increasing of severity of *Zoothamnium* sp. in pleopodswas contrarily matched with *Acineta* sp. in gills. Similar to the result of Abedian & Ebrahimi (2006) our results

showed that *Zoothamnium* sp. is more prevalent pathogen among *peritrichous ciliates* (88.66% to 79%) in pleopods. The least value for shrimp ciliated infections belong to *Acineta* with 2% of shrimp pleopods. This result is contrary to the result of Abedian & Ebrahimi (2006) that recorded *Vorticella* sp. has least prevalence among ciliates (0.24%). In another survey (Mayen-Estrada R. & Aladro-Lubel M. A. 2002) *Vorticella* sp. was the most prevalent peritrichous for crayfish attached to pereopods and gills. This result is matched to the result of Chakraborti & Bandyapadhyay (2011) that confirmed *Vorticella* sp. the most frequent ciliates from tiger shrimp. They showed the infection increase at 29-31°C and decrease above or below this degree. Thus, an optimum temperature of 29-31°C is required for growth and survival of the protozoan parasites. Since they are epibionts, the infection caused by them at a low density is non pathogenic but heavy infection may cause fouling of gills and appendages. They may even cause death since they interfere with respiration and locomotion (Overstreet 1973). It is concluded the *peritrichous ciliates* are more frequent ciliates causing mortality in cultured shrimps at high density in higher temperature and ammonia compounds.

References

- Abedian A. & Ebrahimi M. (2006) Survey and identification of parasitic infections of cultured shrimp in Chabahar area, Iran. *Iranian Fisheries Scientific Journal* 15, 109-118.
- Afsharnasab M. (2012) Review of WSD in Iran (Past, Present, Future) and the effect on shrimp production Paper present in 17th Iranian Veterinary Congress, Tehran, Iran 28-30 April.
- Chakraborti J. & Bandyapadhyay P. (2011) Seasonal incidence of protozoan parasites of the black tiger shrimp (<i>Penaeus monodon</i>) of Sundarbans, West Bengal, India. *Journal of Parasitic Diseases* 35, 61-65.
- Jalali Jafari B. (1990) Diseases of Cultured Shrimps, Tehran, Fisheries Org.
- Jayasree L., Janakiram P. & Madhavi R. (2001) Epibionts and parasites of *Machrobrachium rosenbergii* and *Metapenaeus dobsoni* from Gosthani estuary. *Journal of Natural History* 35, 157-167.
- Johnson S.K. (1990) Handbook of Shrimp Diseases, Texas, Department of Wildlife and Fisheries Sciences, Texas A & M University.
- Kakoolaki S. (1997) Severe mortality in zoea of cultured *Penaeus semisulcatus* due to *Zoothamnium* sp. News letter of Iranian Fisheries Research Organization 18.
- Kakoolaki S., Sharifpour I., Sharifrohani M., Ebrahimzadeh Mousavi H.A., Afsharnasab M., Houghoughirad N., Dashtiannasab A. & Nezamabadi H. (2013) Hemocytosis, a new disease in cultured shrimp, *Fenneropenaeus indicus*. *Iranian Journal of Fisheries Sciences* 12, 605-619.
- Kakoolaki S., Soltani M., Ebrahimzadeh Mousavi H.A., Sharifpour I., Mirzargar S., Afsharnasab M. & Motalebi A.A. (2011) The effect of different salinities on mortality and histopathological changes of SPF imported *Litopenaeus vannamei*, experimentally exposed to White Spot Virus and a new differential hemocyte staining method. *Iranian Journal of Fisheries Sciences* 10, 447-460.
- Lightner D. (1996) A Handbook of Pathology and Diagnostic Procedures for Diseases of Penaeid Shrimp, LA, Baton Rouge, World Aquaculture Society.
- Malolahi A. & Mokhayer B. (2001) Survey on parasitic fauna of farmed shrimp in Ghofas area, Abadan in south of Iran. Tehran: IFRO.
- Mayen-Estrada R. & Aladro-Lubel M. A. (2002) Distribution and prevalence of 15 species of epibiont Peritrich ciliates on the crayfish *Cambarellus patzcuarensis* Villalobos, 1943 in lake Patzcuaro, Michoacan, Mexico. *Crustaceana* 74, 1213-1224.
- Oie (2006) Manual of diagnostic for Aquatic Animals

[Online]. France: OIE. Available: http://www.oie.int/eng/normes/fmanual/manual2006/A_00047.htm [Accessed 12.11.2010].

Overstreet R.M. (1973) Parasites of some penaeid shrimp with emphasis on reared hosts. *Aquaculture* 2, 105-140.

Tamjidi B. (1995) Isolation and Identification of the protozoa, *zoothamnium* sp. of cultured shrimp in Heleh farms, south of Iran. *Iranian Fisheries Scientific Journal* 4, 97-104.

شیوع و شدت تک یاخته‌های جلدی میگو پا سفید سایت حله، جنوب ایران

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چکیده

توسعه پرورش میگو با بروز بیماری‌های کشنده از جمله ویروسی، باکتریایی و تک یاخته‌ای انگل میگو همراه بوده است. مطالعه ما ارائه وضعیت چند انگل تک یاخته ای مهم میگو پا سفید در استخرهای پرورشی در ایران در طول دوره ۲۰۱۱ تا ۲۰۱۲ شان می‌دهد. به همین منظور یکصد میگو زنده به طور تصادفی ایستگاه حله بوشهر در جنوب ایران تهیه شد. شیوع و شدت دو شاخص مهم است که در این تحقیق بکار گرفته شد. ابتدا از ناحیه آبشش و اسکلت خارجی بدن میگوها نمونه‌های فشاری تهیه گردید و سپس بر روی لام قرار داده شدند. آنگاه لام‌ها جهت بررسی کمی و کیفی در زیر میکروسکوپ مورد بررسی قرار گرفتند. براساس نتایج این مطالعه انگل تک یاخته‌ای *Zoothamnium* SP. بعنوان پاتوژن شایع‌تر در میان مژه داران (%۷۹-۸۸/۶) در پاهای شنا می‌باشد. در جدایه‌های ما *Acineta* sp. به عنوان عامل شایع در درجه بعدی هم در پاهای شنا و هم در آبشش تأیید گردید. لذا اینگونه نتیجه‌گیری می‌شود که، مژه داران مکرراً باعث مرگ و میر در میگوهای پرورشی بخصوص در تراکم های بالا، در درجه حرارت بالاتر و آمونیاک بالا می‌باشد.

واژه‌های کلیدی: میگو، بیماریهای انگلی، مژه دار، شیوع، شدت.

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