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Food of *Anematichthys repasson* and *Ompok bimaculatus* from Kaeng Lawa, Thailand

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Abstract. Food of *Anematichthys repasson* (Bleeker, 1853) and *Ompok bimaculatus* (Bloch, 1797) in Kaeng Lawa, Thailand were investigated seasonally. Percentage of Index of Relative Importance (%IRI) of food items for these two fish species was dependent on season and fish species with statistical significance ($p < 0.05$). Their diets were dominated by aquatic insects, while other animal groups, plant parts and algae were considered as occasional food. The dietary overlap between *A. repasson* and *O. bimaculatus* has low similarity in the hot, rainy and cool seasons (0.05, 0.03, 0.10), respectively. The result of diet composition indicates that they are carnivores, which agrees with the relative length of gut being less than 1. The length-weight relationship shows that they have allometric growth.

Key Words diet composition, Index of Relative Importance, length-weight relationship, relative length of gut.

Introduction. Kaeng Lawa, a permanent semi-natural freshwater wetland, is situated in Khon Kaen Province of northeastern Thailand. It is a major source for providing water to agriculture, irrigation and fishery for local community. It is also an economically important resource for local people because they can harvest fish, aquatic plants, algae and other animals for their food and sell for income (Office of Natural Resource and Environmental Policy and Planning 1999). In particular, fish are an important natural source of protein and a cheap resource for local people's consumption. *Anematichthys repasson* (Bleeker, 1853) belongs to the family Cyprinidae, and occurs at mid-water to bottom level in small rivers, canals, ponds, and reservoirs from Indonesia to Thailand (Rainboth 1996). *Ompok bimaculatus* (Bloch, 1797) is a catfish belonging to the family Siluridae. This species is widely distributed in inland waters throughout South and Southeast Asia (Planetcatfish 2012).

According to Mazlan et al (2007), information about the feeding biology of fish may help to understand how the freshwater fish share the naturally limited resources in the aquatic ecosystem. Abyerami & Sivashanthini (2008) also stated that the knowledge of feeding habits and food of fish is important, especially when a high consumption demand occurred. Furthermore, the survey of fish fauna may be a basic data that will be valuable to assess future environmental impacts of economic development (Nyanti et al 1999) or trophic impact of invasive fish on reservoir ecosystem (Feroz Khan & Panikkar 2009) or conservation and management for resident and threated species (Sarkar et al 2013). Published data on the food of *A. repasson* and *O. bimaculatus* from Kaeng Lawa is not available.

Aims of this study are to investigate (1) diet composition, niche breadth, niche overlap, (2) length-weight relationship (LWR), condition factor (K), and (3) stomach fullness, gonadosomatic index (GSI), relative length of gut (RLG) of *A. repasson* and *O. bimaculatus*.

Material and Method. Fish samples were purchased from fishermen collected seasonally from Ban Don Po Daeng (latitude 16° 9' 22.18'' N, longitude 102° 41' 42.61'' E) and Ban

Kog Sam Ran (latitude 16° 10' 23.24'' N, longitude 102° 41' 30.39'' E), which are located in Kaeng Lawa, Khon Kaen Province (Figure 1). The sampling was carried out seasonally during hot (May 2011), rainy (September 2011) and cool seasons (November 2011). Total length (TL, cm), fork length (FL, cm) and body weight (BW, g) of individual fish were recorded. Fish samples were fixed in 10% formalin. Each stomach and gonad was removed from the individual fish. Gut lengths (GL, cm), and gonad weights (GW, g) were also recorded. Each stomach was slit opened, levels of stomach fullness were observed by the naked eye and the degrees of fullness were scored by 0-4 (Amisah & Agbo 2008). A content of each stomach was poured onto a petri-dish. One drop of random sample of stomach content was droped on a slide for preparing the semi-permanent slide. The slide was observed under the light microscope (Olympus CH 30), and percentages of frequency of food occurrences (%F) were recorded. The rests of food items in the petri-dish were observed under the stereo microscope (Nikon SMZ445-460) to determine the percentages of number of food items (%N) and percentages of volume of food items (%V) (Hyslop 1980). The diet composition of each individual fish was identified to the lowest possible taxon based on Morse et al (1994), Wongrut (1998, 2001), Peerapornpisal (2005), Sangpradub & Boonsoong (2006) and Merritt et al (2008).

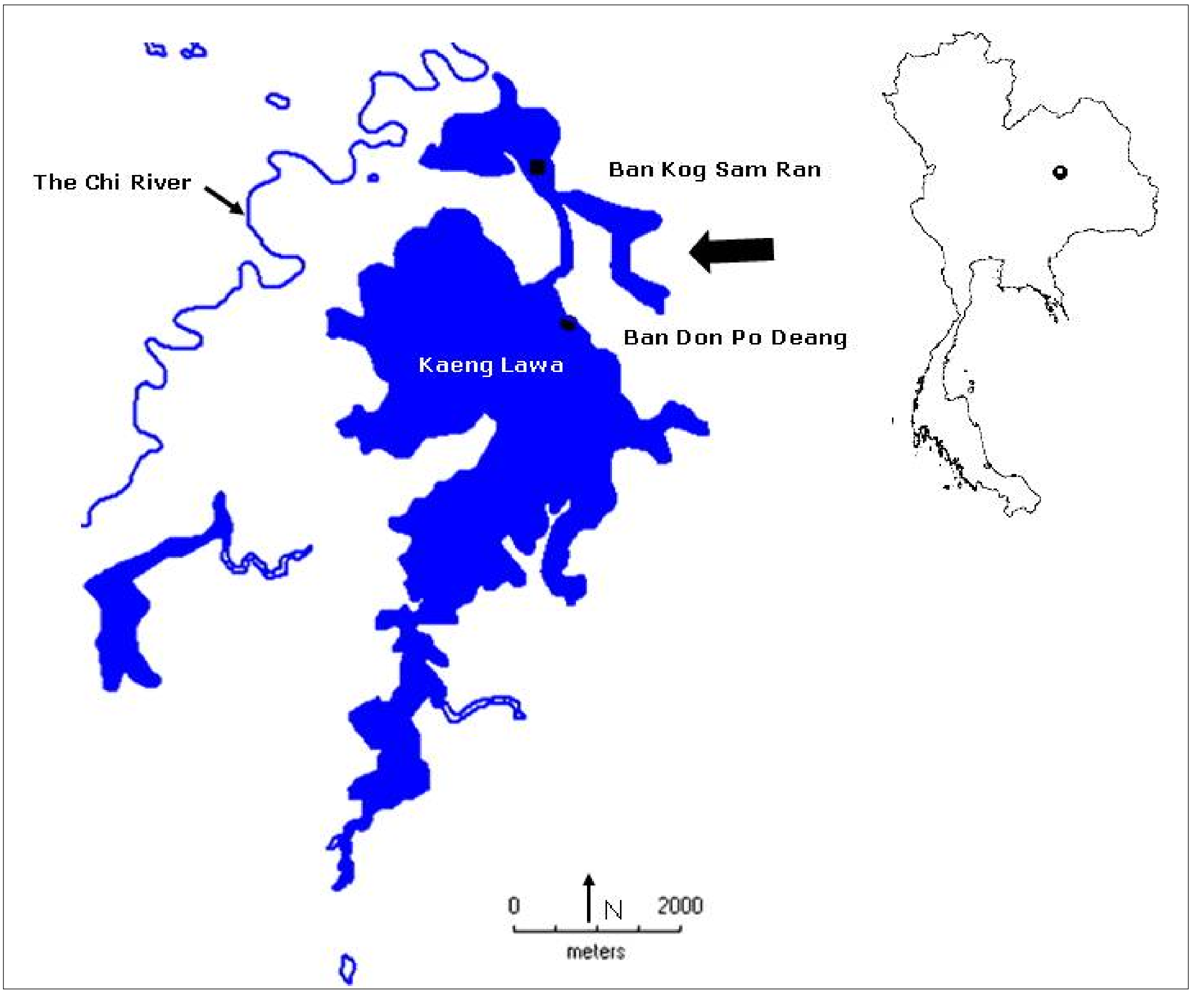

Figure 1. Map showing location of sampling site.

Data analyses. Index of relative importance (IRI) is a measurement of number, volume and frequency of occurrence of food items to evaluate the relationship of the various food items found in the stomach. It is estimated by IRI = %F x (%N + %V) (Pinkas et al 1971). This index has been modified and expressed as a percentage of the index of relative importance (%IRI) as %IRI = (IRI/Σ IRI) x 100 (Hacunda 1981). Chi-square test (χ^2) for independence was used for testing the significance of the relationships between %IRI and fish species among seasons (Zar 2010).

Levins's measures of niche breadth reflected the diversity of species' use of available resources and were calculated using the equation $B_A = (B-1)/(n-1)$, where B_A = Levins's standardized niche breadth, B = Levins's measure of niche breadth, n = number of possible resource states (Krebs 1999). Morisita-Horn index was used to estimate niche overlap (Krebs 1999). The calculated value of Morisita-Horn index ranges within 0-1 as follows 0.00-0.29 = low similarity, 0.30-0.60 = medium similarity, 0.61-1.00 = high similarity with biological significance (Langton 1982).

The length-weight relationship (LWR) of a fish was expressed by $W = aL^b$, where W = total body weight (g), L = total length (cm), a = constant, and b = growth exponent (Wootton 1992). The b values were tested for differences from an isometric value (b = 3) using a one-sample t-test (Zar 2010). The condition factor (K) was estimated by $K = 100\ W/L^b$, where K = condition factor, W = total body weight (g), L = total length (cm), b = growth exponent (= 3) (Wootton 1992; Ayoade & Ikulala 2007; Abowei 2009). Mean variation of K value of each fish species among seasons was tested for differences using the analysis of variance (one-way ANOVA) (Zar 2010).

The gonadosomatic index (GSI) of the fish was estimated seasonally using GSI = (GW/BW) x 100, where GW = gonad weight (g), BW = body weight (g) (Emmanuel & Ajibola 2010). Relative length of gut (RLG) was calculated by the ratio of gut length to fork length as RLG = GL/FL, where GL = gut length, FL = fork length (Yamagishi et al 2005).

Results and Discussion

Diet composition, niche breadth, niche overlap. Table 1 shows that *A. repasson* fed on 12, 17 and 15 food items in the hot, rainy and cool seasons, respectively. Aquatic insects were the highest %IRI in all season, and the %IRI of each food item for *A. repasson* was dependent on the season (χ^2 = 2.14, df = 68, $p < 0.05$). *O. bimaculatus* also consumed aquatic insects heavily in all seasons, and fed on 4, 8 and 12 food items in the hot, rainy and cool seasons, respectively (Table 2). It showed that the %IRI of each food item of *O. bimaculatus* was dependent on the season (χ^2 = 1.27, df = 17, $p < 0.05$). From the statistical analysis, it resulted that %IRI of each food item from all 3 seasons was dependent on fish species (χ^2 = 1.83, 1.54, 1.88, df = 21, 29, 26, $p < 0.05$ in the hot, rainy and cool seasons, respectively).

The diet composition showed that *A. repasson* consumed more variety of food items than *O. bimaculatus*. These results agree with the observations of Kakkaeo et al (2004), who reported that *A. repasson* inhabiting Ubolratana Reservoir, Khon Kaen Province in Thailand fed on insect larvae, detritus, zooplankton, microbenthos, aquatic insects, phytoplankton, macrophytes and epiphytical algae. In addition, Rainboth (1996) reported that *A. repasson* from the Mekong River in Cambodia consumed aquatic insects and some aquatic macrophytes. In the current study, it was found that *O. bimaculatus* consumed aquatic insects, shrimps, fish, gastropods, plant parts and algae. These results are similar to Hanjavanit & Sangpradub (2009), who reported that *O. bimaculatus* inhabiting Nong Han Kumphawapi, Udon Thani Province, Thailand fed primarily on aquatic insects, followed by zooplankton, ostracods, fish, shrimps, plant materials and algae. It is also in agreement with the findings of Rainboth (1996), who reported that *O. bimaculatus* from the Mekong River in Cambodia fed on crustaceans, fish and molluscs. In this study, the aquatic insects especially Chironomid and Ephemeropteran larvae were the main food items for *A. repasson* and *O. bimaculatus*, respectively. Whereas either a small amount of plant materials or algae were also observed from stomach contents of some individual fish, this may be due to accidental consumption of plant materials along with the principal food item. According to Courney & Merritt (2008), Chironomid larvae are often abundant near vegetation and dwell on sandy bottoms. The stomach analyses showed that each of the same species consumed more varieties of foods than those reports, which may be due to difference in locality, and with level of classification of food items based on the lowest possible taxon.

From statistically analysis, there are significant relationships between %IRI, season and fish species ($p < 0.05$). These results reflected that the food composition of each species is variable among seasons, which may be related to the availability of the different food sources among season and type of habitat (Schafer et al 2002). According to Islam et al (2004), the feeding habits and foods of fish species vary from season to season and fish consume different types of food. In addition, Ayoade & Ikulala (2007) have also shown that availability of foods is often cyclical event due to climate or other environmental conditions or their life histories.

In the hot season, *O. bimaculatus* had the widest dietary breadth (B = 3.19), followed by *A. repasson* (B = 2.86). In the rainy season, dietary breadth was 0.23 (B = 2.62), and 0.10 (B = 2.62), and in the cool season, dietary breadths were 0.46 (B = 5.56), and 0.23 (B = 4.25) for *O. bimaculatus* and *A. repasson*, respectively. Dietary overlap of *A. repasson* and *O. bimaculatus* were 0.05, 0.03 and 0.10 in the hot, rainy and cool seasons, respectively. These indicate that the niche overlaps of *A. repasson* on *O. bimaculatus* have low similarity. This result indicates that *O. bimaculatus* is more generalized than *A. repasson*. The diet of *O. bimaculatus* was wider than that of *A. repasson* in all seasons. Niche breadth quantifies the diversity or breadth of the food resources utilized by a given species (Guruge & Amarasinghe 2008).

According to Fjøsne & Gjøsæter (1996), the potential food competition among the different species was mostly reduced or avoided through different choices of food items. However, high dietary overlap is not coincident with existing food competition among species of fish; the dietary overlap often increases with increasing prey abundance because it is easier for fish to catch more prey (Macpherson 1981). In addition, Smith & Smith (2001) stated that considerable niche overlap does not necessarily mean high competitive interaction and competition involves a short supply of resources.

Length weight relationship (LWR), and condition factor (K). As shown in Table 3, the b value of *A. repasson* was lower than 3 (1.314, 2.381 and 2.921 in the hot, rainy and cool seasons, respectively). The *t* value calculations in the hot, rainy and cool seasons were lower than the *t*-distribution with statistically significant difference ($p < 0.05$). This result shows that the growth of *A. repasson* was negative allometric ($b < 3$, $p < 0.05$) for all seasons. The b value of *O. bimaculatus* was higher (3.608) in the hot season and lower (2.413 and 2.429) in the rainy and cool seasons than 3. The *t* value calculations in the hot, rainy and cool seasons were lower than the *t*-distribution with statistically significant difference ($p < 0.05$). This result indicates that *O. bimaculatus* had a positive allometric growth ($b > 3$, $p < 0.05$) in the hot season, which may be due to a small sample size (n = 7) with a wide range of body weight and length in this study, and had a negative allometric growth ($b < 3$, $p < 0.05$) in both rainy and cool seasons. Where as, Mishra et al (2013) reported that regression parameter b of *O. bimaculatus* from River Ghaghara in India ranged from 3.06 to 3.76. According to Wootton (1992), the b value in the LWR of fish can indicate food intake and growth pattern, and may present spatial and temporal variations according to food availability, habitat type, water temperature, and reproductive activities.

Mean K value of *A. repasson* was higher than 1 (Table 3), which indicates that this species is in a better condition. Whereas, the mean K value for *O. bimaculatus* is less than 1 for all seasons, which indicates that this species was in a poorer condition. It is in agreement with Mishra et al (2013), who reported that *O. bimaculatus* from River Ghaghara, India had condition factor ranged from 0.524-0.572. These results show that the K value varies greatly from species to species, which is supported by Swingle & Shell (1971). According to Lagler (1956) and Parihar & Saksena (2010), the K values are influenced by age of fish, sex, season, state of maturation, fullness of gut, type of food consumed, amount of fat reserve and degree of muscular development.

Stomach fullness, gonadosomatic index (GSI), relative length of gut (RLG). Observation of feeding intensity clearly indicated that percentage of empty stomachs of *A. repasson* and *O. bimaculatus* was high in the hot season (26.32% and 71.43%, respectively) and low in the rainy seasons (12.12% and 37.05%, respectively), which coincided with high mean values of GSI in the hot and rainy seasons (3.68±0.51, 2.84±0.73 for *A. repasson* and 0.61±0.13, 1.96±0.54 for *O. bimaculatus*) (Table 4). This reveals that low feeding intensity in the 2 fish species may be synchronized with their spawning because most fish had gravid eggs fully occupying their peritoneal cavity in the rainy season. This result is in agreement with the study of Nuangsit & Chansri (2008), who reported that *A. repasson* started to lay eggs from April to September in Lamtakong reservoir, Nakhon Ratchasima Province, Thailand. However, the result of spawning period of *O. bimaculatus* was similar to the observed gonadal development of *O. bimaculatus* in the Nong Koh reservoir, Chonburi Province, Thailand, which started vitellogenesis from July through September (Renunuan & Silapachai 2005), which is similar to the spawning of *Ompok pabda* in River Gomti, India occurred between June to September (Gupta et al 2014). These findings strengthen the evidence that feeding intensity for *A. repasson* and *O. bimaculatus* is related to the reproductive cycle rather the seasonal climatic changes.

In the current study, the results of diet composition analysis reveal that *A. repasson* and *O. bimaculatus* are carnivores, which is based partly on the values of RLG being less than 1. The mean value of RLG for *A. repasson* was 0.82, 0.83 and 0.90, and for *O. bimaculatus* was 0.72, 0.47 and 0.59 in the hot, rainy and cool seasons, respectively (Table 4). According to Yamagishi et al (2005), RLG less than 1 indicates that a fish is carnivorous, whereas RLG greater than 1 indicates that the fish is an herbivore or omnivore. Another unusual finding was plant materials in the stomach, which may be due to some aquatic insects (especially Chironomid larvae) inhabiting plant parts. It was found that algae occurred incidentally, and these may have been picked up while foraging for the main food items. Therefore, fish consumed the plant materials and algae by accident.

From the analyses of food, it is evident *A. repasson* is neither a true surface feeder nor a true bottom feeder, but rather that their food items mainly consist of aquatic insects (especially Hemipterans and Chironomid larvae), molluscs, zooplankton (cladocerans, ostracods and hydracarina) and fish are distributed throughout the water column. This result indicates that *A. repasson* is a benthopelagic fish, which agrees with Froese & Pauly (2014). According to Feroz Khan & Panikkar (2009), *O. bimaculatus* and other indigenous catfishes were considered as voracious feeders. In the present study the main food items of *O. bimaculatus* were aquatic insects, shrimps, fish and oligochaetes, so this may be regarded as a demersal fish, which agrees with Froese & Pauly (2014).

Table 4

The seasonal percentage of the stomach condition, mean of seasonal gonadosomatic index ± standard error (GSI±SE), relative length of gut (RLG) of *A. repasson* and *O. bimaculatus* from Kaeng Lawa, Khon Kaen Province, Thailand

Fish species	*Season*	*Empty (%)*	*¼ (%)*	*½ (%)*	*¾ (%)*	*Full (%)*	*GSI±SE*	*RLG*
A. repasson	Hot	10 (26.32%)	16 (42.10%)	10 (26.32%)	2 (5.26%)	0 (0%)	3.68±0.51	0.82
	Rainy	4 (12.12%)	20 (60.61%)	6 (18.18%)	3 (9.09%)	0 (0%)	2.84±0.73	0.83
	Cool	10 (27.78%)	16 (44.45%)	7 (19.44%)	3 (8.33%)	0 (0%)	0.88±0.14	0.90
O. bimaculatus	Hot	5 (71.43%)	2 (28.57%)	0 (0%)	0 (0%)	0 (0%)	0.61±0.13	0.72
	Rainy	12 (37.50%)	11 (34.37%)	2 (6.25%)	7 (21.88%)	0 (0%)	1.96±0.54	0.47
	Cool	10 (27.76%)	11 (30.56%)	7 (19.45%)	6 (16.67%)	2 (5.56%)	0.32±0.03	0.59

Table 1

A summary of percentage frequency of occurrence (%F), numerical percentage (%N), volumetric percentage (%V) and percentage of index of relative importance (%IRI) of various food items in the gut of *A. repasson* for 3 seasons

Food item	*Hot season (n = 38)*					*Rainy season (n = 33)*					*Cool season (n = 36)*				
	%F	*%N*	*%V*	*IRI*	*%IRI*	*%F*	*%N*	*%V*	*IRI*	*%IRI*	*%F*	*%N*	*%V*	*IRI*	*%IRI*
Algae	39.29	26.58	4.86	1235.28	10.02	24.14	10.85	0.50	273.99	2.39	19.32	6.25	0.32	126.93	1.39
Plant materials	35.71	4.70	3.46	291.39	2.36	34.48	24.41	8.03	1118.53	9.73	23.08	8.75	3.08	273.04	2.96
Phylum Rotifera						6.90	1.55	0.18	11.94	0.10	3.85	1.67	3.84	21.21	0.23
Phylum Mollusca	**7.14**	**0.36**	**1.96**	**16.56**	**0.14**	**6.90**	**0.78**	**1.66**	**16.84**	**0.15**	**42.31**	**19.58**	**28.54**	**2035.96**	**22.08**
Gastropods	7.14	0.36	1.96	16.56	0.14	6.90	0.78	1.66	16.84	0.15	15.38	2.91	5.35	127.04	2.07
Bivalvia											30.77	16.67	23.19	1226.49	20.01
Phylum Arthropoda															
Shrimps						3.45	0.39	0.34	2.52	0.02					
Hydracarina	14.29	0.73	0.75	21.15	0.17	20.69	4.26	3.65	163.66	1.42	3.85	0.84	0.96	6.93	0.07
Ostracods	39.29	7.05	10.71	697.79	5.66	24.14	4.26	2.86	171.88	1.50	19.23	5.00	2.19	138.26	1.50
Cladocerans	7.14	38.52	2.06	289.74	2.35	34.48	20.16	14.34	1189.56	10.35	23.08	12.08	8.61	477.53	5.18
Copepods						3.45	0.39	0.34	2.52	0.02	23.08	7.08	3.23	237.95	2.58
Aquatic insects	**100**	**21.70**	**76.06**	**9776.00**	**79.29**	**89.66**	**32.17**	**62.58**	**8495.29**	**73.94**	**73.08**	**37.50**	**42.50**	**5846.40**	**63.40**
Order Coleoptera						3.45	0.39	2.76	10.87	0.20					
Order Ephemeroptera	14.29	0.72	4.82	79.17	1.29	3.45	0.39	3.45	13.25	0.25	11.54	2.08	1.62	42.70	0.91
Order Hemiptera	67.86	11.03	39.68	3441.18	56.00	6.90	0.78	1.55	16.08	0.30	46.15	8.34	24.81	1529.87	32.54
Order Diptera	35.71	5.97	14.64	735.98	11.98	58.62	24.03	29.51	3138.52	58.97	34.62	25.00	14.42	1364.72	29.03
Order Odonata						3.45	0.39	0.35	2.55	0.05					
Order Trichoptera	39.29	3.26	9.42	498.20	8.11	17.24	2.71	7.45	175.16	3.29	11.54	2.08	1.65	43.04	0.92
Unidentified aquatic insects	14.29	0.72	7.50	117.46	1.91	27.59	3.48	17.51	579.11	10.88					
Fish						6.90	0.78	5.52	43.47	0.38	7.69	0.83	5.96	52.22	0.56
Unidentified food items	3.57	0.36	0.14	1.79	0.01						3.85	0.42	0.77	4.58	0.05
Total		100	100	12329.70	100		100	100	11490.20	100		100	100	9221.01	100

Table 2

A summary of percentage frequency of occurrence (%F), numerical percentage (%N), volumetric percentage (%V) and percentage of index of relative importance (%IRI) of various food items in the gut of *O. bimaculatus* for 3 seasons

Food item	*Hot season (n = 7)*					*Rainy season (n = 32)*					*Cool season (n = 36)*				
	%F	*%N*	*%V*	*IRI*	*%IRI*	*%F*	*%N*	*%V*	*IRI*	*%IRI*	*%F*	*%N*	*%V*	*IRI*	*%IRI*
Algae						5.00	73.12	0.75	369.35	5.36	7.69	2.67	0.01	20.61	0.28
Plant materials	100	44.45	25.00	6944.50	37.15	25.00	9.38	4.35	343.25	4.98	15.38	33.33	5.19	592.44	7.90
Phylum Annelida											**11.54**	**4.00**	**11.54**	**179.33**	**2.39**
Oligochaetes											11.54	4.00	11.54	179.33	2.39
Phylum Mollusca											**3.85**	**1.33**	**0.15**	**5.70**	**0.08**
Gastropods											3.85	1.33	0.15	5.70	0.08
Phylum Arthropoda															
Shrimps						50.00	8.75	48.00	2837.50	41.19	23.08	8.00	11.15	441.98	5.89
Aquatic insects	**100**	**44.44**	**60.00**	**10444.50**	**55.87**	**60.00**	**8.75**	**46.90**	**3339.00**	**48.47**	**57.69**	**33.33**	**36.19**	**4010.61**	**53.49**
Order Coleoptera											7.69	2.66	2.12	36.76	1.48
Order Ephemeroptera	50.00	33.33	35.00	3416.75	36.55	5.00	0.63	2.50	15.63	0.38	26.92	9.33	7.69	458.18	18.47
Order Diptera						5.00	0.63	2.50	15.63	0.38	11.54	8.00	3.12	128.32	5.17
Order Orthoptera						5.00	0.62	5.00	28.13	0.69					
Order Odonata						10.00	1.25	5.50	67.50	1.66	19.23	6.67	16.15	438.83	17.69
Unidentified aquatic insects	50.00	11.11	25.00	1805.50	19.32	50.00	5.62	31.40	1851.25	45.36	19.23	6.67	7.11	264.99	10.68
Fish	50.00	11.11	15.00	1305.50	6.98						42.31	17.34	35.77	2247.08	29.97
Total		100	100	18694.50	100		100	100	6889.10	100		100	100	7497.75	100

Table 3

The length-weight relationships and condition factor (K) for *A. repasson* and *O. bimaculatus* from Kaeng Lawa, Khon Kaen Province, Thailand (N = number of fish examined, W = body weight, TL = total length, FL = fork length, Min = minimum, Max = maximum, a = constant, b = growth exponent, r = correlation coefficient, r^2 = coefficient of determination, SE = standard error, SD = standard deviation)

Species	*Season*	*N*	*W (g)* Min-Max (Mean±SD)	*TL (cm)* Min-Max (Mean±SD)	*FL (cm)* Min-Max (Mean±SD)	$W = aL^b$ *a*	*b*	*SE (b)*	*r*	r^2	*t value*	*p value (difference of b from 3)*	*K±SD*	*p value of K among season*
A. repasson	Hot	38	19.00-50.00 (27.56±7.93)	11.10-15.50 (13.04±1.03)	9.90-13.60 (11.20±0.93)	1.232	1.314	0.380	0.500	0.250	-4.437	< 0.05*	1.25±0.38	> 0.05
	Rainy	33	20.00-55.00 (30.21±8.14)	12.00-15.60 (13.26±1.04)	9.80-13.20 (11.07±0.94)	1.114	2.381	0.135	0.954	0.910	-4.585	< 0.05*	1.27±0.10	> 0.05
	Cool	36	10.00-45.00 (21.97±9.05)	9.50-14.90 (11.67±1.33)	8.20-12.60 (9.94±1.33)	1.079	2.921	0.226	0.912	0.831	-0.350	< 0.05*	1.31±0.23	> 0.05
O. bimaculatus	Hot	7	30.00-96.00 (40.14±23.00)	15.20-18.00 (16.68±0.97)	14.40-16.80 (15.44±0.85)	0.019	3.608	1.738	0.768	0.590	-0.350	< 0.05*	0.86±0.38	> 0.05
	Rainy	32	10.00-55.00 (24.38±12.61)	11.20-17.50 (13.75±1.98)	10.20-16.50 (12.74±1.92)	0.966	2.413	0.310	0.822	0.676	-1.894	< 0.05*	0.87±0.39	> 0.05
	Cool	36	15.00-95.00 (41.39±15.35)	12.90-21.30 (17.35±1.91)	11.70-19.80 (16.08±1.81)	0.943	2.429	0.228	0.877	0.770	-2.504	< 0.05*	0.77±0.16	> 0.05

*significant at $p < 0.05$

Conclusions. The information obtained reflects that Kaeng Lawa constitutes a remarkable area for conservation of the biodiversity of phytoplankton, zooplankton, macroinvertebrates (especially aquatic insects), fish and other wildlife communities. The study provides data on the diet compositions, the length-weight relationship, condition factor and feeding habit of *A. repasson* and *O. bimaculatus* among seasons. This information may be useful for developing management program on fish culture and capture in the wetland fishery.

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