

*Full Length Research Paper*

# **Insect biodiversity in Kuwait**

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**Natural causes, together with the deliberate destruction of the environment with the objective of forcing political, military and means of civilization have resulted in great deterioration of the environment. The insect fauna of Kuwait has suffered from such destructions, resulting in some becoming extinct, while others are threatened with extinction from Kuwait desert, however, others still flourishing. This contribution records the status of the entomo-fauna in Kuwait prior to the Gulf War (from 1980 - 1990), and after the Gulf War (from 1992 - 2008), including the effects of new modern dwellings and severe draught. During the first period 474 species of insects were recorded from Kuwait (356 genera, 109 families, 19 orders) but the numbers of species increased to 492 (273 genera, 116 families, 19 orders) during the second period. The differences are caused by disappearance and re-appearance. This study will discuss the reasons for increase, disappearance and reappearance of insects in the desert ecosystem of Kuwait.**

**Key words:** Kuwait, insects, Gulf War, human activities, extinction, threatened with extinction, flourish.

## **INTRODUCTION**

Kuwait is located in the north eastern part of the Arabian Peninsula. It is bordered on the north and west by Iraq and on the south by Saudi Arabia (Figure 1); it covers a total area of 17,850 sqkm of desert and low offshore islands.

The primary cause of species extinction is habitat destruction that results from the expansion of human populations and activities.

Not all species are equally susceptible to extinction from human activities. The susceptibility of species to extinction is related to a number of life history characteristics that influence their vulnerability to human activities as well as natural catastrophes. Endemic species are particularly susceptible to extinction because a loss of habitat in the one geographic region will result in a complete loss of habitat for the species. Some species have very specialized habitat requirements, making them extremely susceptible to habitat alterations.

Kuwait has faced a serious destruction of its habitat either in peace or war time, during the Gulf War, the local environment was subjected to drastic events, (Fowler et al., 1993; Al-Sulaimi et al., 1993). The Gulf War is used in this study to designate the period from the invasion in August 2, 1990 till the completion of the liberation in February 26, 1991. During this period the desert environment was subjected to drastic damages, such as soil compacting and translocation due to military activities, formation of ditches, mine fields, tank movement and

soldier's bunkers, contamination of soil and air due to explosion and ignition of over 600 oil wells (Zaman, 1998).

Animal escaped from their natural habitats due to the noise created by the war machinery and sludge that killed the upper life forms by its toxicity and killed the deep life forms by suffocation (Alsdirawi, 1994).

Environmentalists emphasized that in term of ecology, the environment will never return to its previous state. This assertion was based on the potential long-term effect on the environment of remnants of war, chemicals used to put out fires, the oil lakes, and the decomposition of residues of refined crude oil.

At peace time, human activities take the largest blame for changing and damaging the natural features of Kuwait desert environment. Kuwait desert is suffering from human misuse of its resources due to overgrazing, cutting wood shrubs, off-road vehicles, seasonal camping and gravel quarrying (Zaman, 1998). Overgrazing affects at least 60%, camping and recreation in open desert areas affect at least 10%; gravel quarrying and military activities affect some 30% of the degraded lands (Misak et al., 2001).

Natural causes such as reduced rainfall and drought have prevent formation of temporarily rain pools, which are the only freshwater bodies available to aquatic insects in Kuwait.

The objective of this study is to compare the status of Kuwait insects for 18 years, divided between the period



Figure 1. Location map of Kuwait.

1980 - 1989 (prior to the Gulf War) and the period 1992 - 2008 (after the Gulf War) and to discuss reasons for the disappearance and re-appearance of some insect species.

## MATERIALS AND METHODS

During the period from 1980 - 1990, an extensive insect collection was launched, using all kind of insect collecting techniques such as the various traps (suction, light, water, stick, pitfall, sweeping, Malaise) and various nets (aerial, water) to collect insects from different parts of Kuwait.

The collected insects were identified, classified according to Al-Houty (1989), photographed and kept in the insect collection laboratory in the department of biological sciences of Kuwait University. Al-Houty (1989) published a book containing all the collected insects and was titled "insects fauna of Kuwait", but after the invasion of Kuwait, this collection was lost because it had been carried outside Kuwait. AL-Houty (1997) published an article listing all the previously collected insects.

To re-establish the insect collection all over again, another insect survey started in 1992 and continued till 2008. All the previous insect collecting techniques were used all over Kuwait; these are the light traps (Heath portable moth trap), two light traps were used, which were switched on at sunset and switched off at sunrise each day, the insects in the traps were anaesthetized by using ether and brought to the laboratory for classification and preservation, the second method of collection was the suction trap (Johnson-Taylor insect trap) with suction fan of 9 inches in diameter (22.86 cm), three suction traps were used to catch flying insects, the insects caught by this trap were sorted out according to the order in the field and then brought to the laboratory for further classification and identification, the third type of collection methods was the

nylon nets, these were used during the frequent visits to the collecting localities, also the water nets were used to collect the aquatic insects from the temporary pools produced in the desert after good rain, the fourth method of collecting insects was the water traps, which are the white and yellow 20 cm diameter plastic basins, these were filled with water mixed with small amount of detergent and placed on the ground of collecting areas about 2m apart, alternating the two colors. The insect collection now is complete and kept safely in Kuwait University.

## RESULTS

During the period 1980 - 1990, prior to the Gulf War, 474 insect species were collected that belong to 19 orders, 109 families and 356 genera (Table 1).

During the period 1992 - 2008, after the Gulf War, 492 species of insects, belonging to 19 orders, 116 families and 273 genera were recorded.

Figure 2 is a diagram showing the total insect species in 19 orders collected in the two periods (refer to Tables 1 and 2 to recall the orders names).

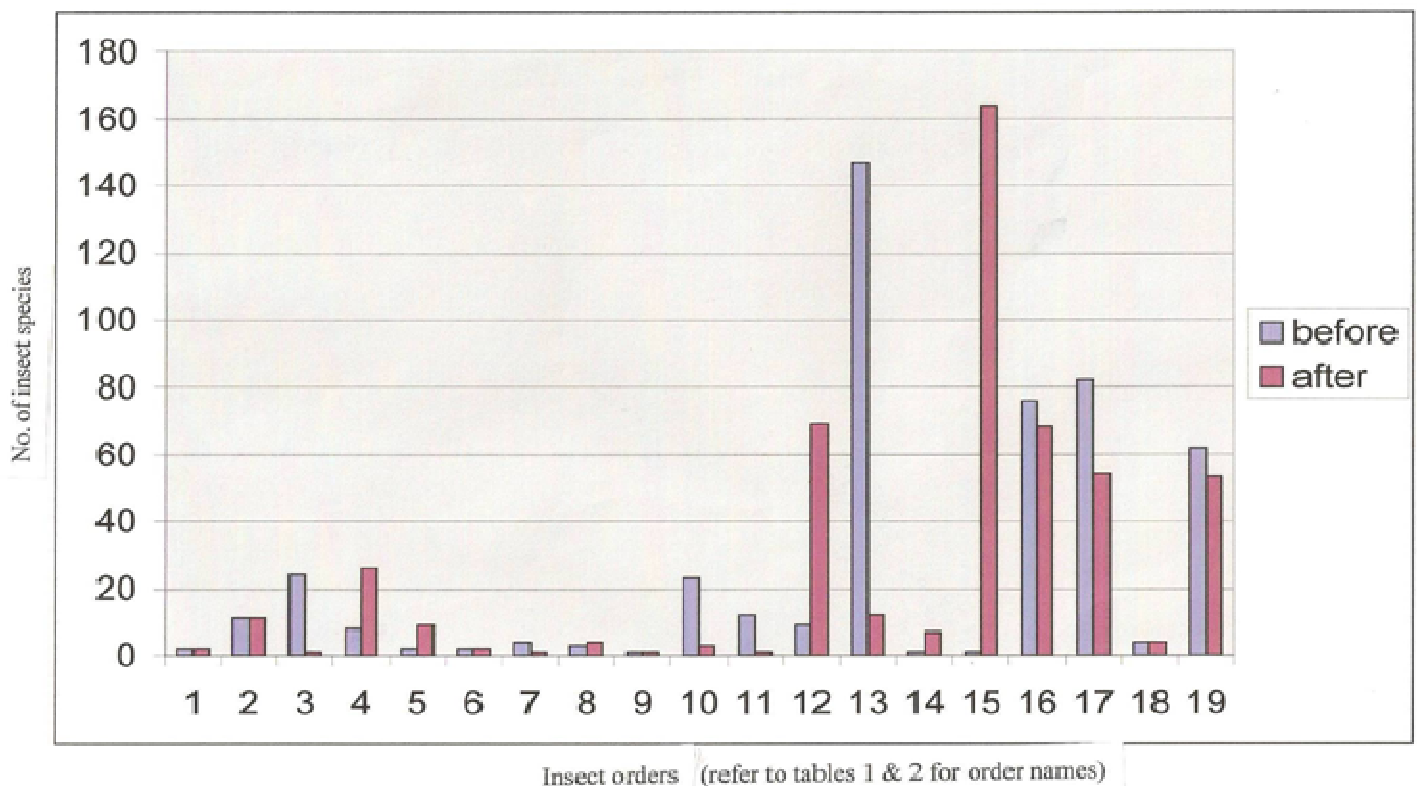
Figure 3 is a diagram showing total insects species in the 21 orders collected from Kuwait in the two periods (refer to Table 3 to recall the order names)

## Statistical analysis

T-test statistical analysis was used for data in Table 3 as shown in Table 4 - 7.

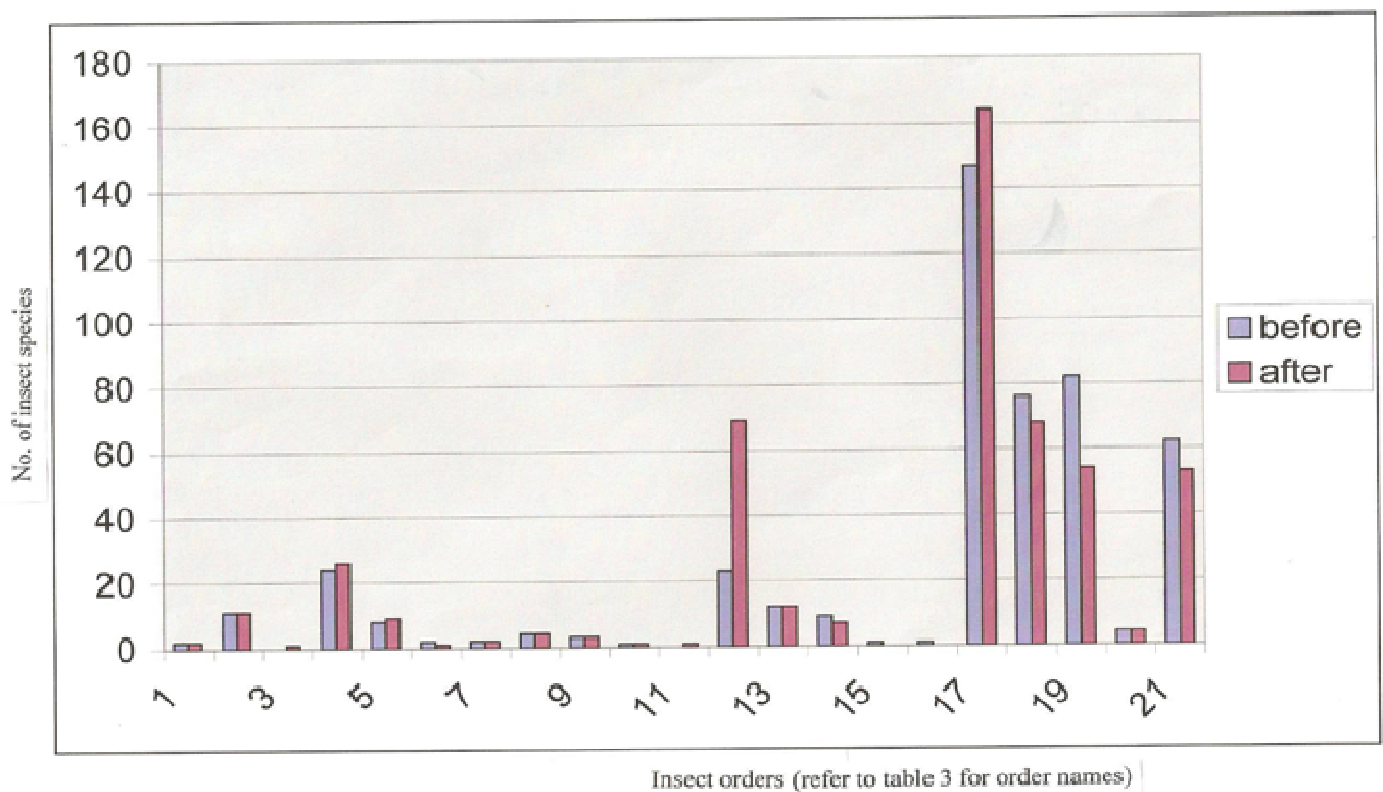
**Table 1.** Insects collected from Kuwait during the period 1980 - 1990.

S/N	Order	Family	Genus	Species
1	Thysanura	1	2	2
2	Odonata	4	8	11
3	Orthoptera	4	17	24
4	Dictyoptera	2	7	8
5	Isoptera	2	2	2
6	Dermaptera	2	2	2
7	Mallophaga	3	4	4
8	Anoplura	2	2	3
9	Thysanoptera	1	1	1
10	Hemiptera	8	21	23
11	Homoptera	4	11	12
12	Neuroptera	2	7	9
13	Coleoptera	23	88	147
14	Strepsiptera	1	1	1
15	Trichoptera	1	1	1
16	Lepidoptera	12	57	76
17	Diptera	22	62	82
18	Siphonaptera	1	2	4
19	Hymenoptera	14	43	62
<b>Total</b>		109	356	474

**Figure 2.** Total insect species in 19 orders collected in the two periods.

**Table 2.** Insects collected from Kuwait from the period 1992 - 2008 (Asterisks indicate newly recorded orders).

Serial no.	Order	Family	Genus	Species
1	Thysanura	1	2	2
2	Odonata	4	8	11
3*	Ephemeroptera	1	1	1
4	Othoptera	4	21	25
5	Dictyoptera	2	7	9
6	Isoptera	2	2	2
7	Dermaptera	1	1	1
8	Mallophaga	3	4	4
9	Anoplura	2	2	2
10*	Embioptera	1	1	1
11	Thysanoptera	1	1	1
12	Hemiptera	16	58	69
13	Homoptera	4	11	12
14	Neuroptera	2	6	7
15	Coleoptera	24	15	164
16	Lepidoptera	14	50	68
17	Diptera	18	39	54
18	Siphonaptera	1	2	4
19	Hymenoptera	15	42	53
<b>Total</b>	19	116	273	492



**Figure 3.** Total insect species in the 21 orders collected from Kuwait in the two periods.

**Table 3.** Compares insect species number collected before and after the Gulf War and designate the newly recorded species.

Serial no.	Order	Before War	After War
1	Thysanura	2	2
2	Odonata	11	11
3	Ephemeroptera *	0	1
4	Orthoptera	24	25
5	Dictyoptera	8	9
6	Isoptera	2	2
7	Dermaptera	2	2
8	Mallophaga	4	4
9	Anoplura	3	3
10	Thysanoptera	1	1
11	Embioptera*	0	1
12	Hemiptera	23	69
13	Homoptera	12	12
14	Neuroptera	9	7
15	Strepsiptera	1	0
16	Trichoptera	1	0
17	Coleoptera	147	164
18	Lepidoptera	76	68
19	Diptera	82	54
20	Siphonaptera	4	4
21	Hymenoptera	62	53
<b>Total</b>	21	474	492

**Table 4.** Paired samples statistics.

	Mean	N	Std. deviation	Std. error mean
<b>Pair 1</b>				
After	23.43	21	39.721	8.668
Before	22.57	21	37.964	8.284

**Table 5.** Paired samples correlation.

	N	Correlation	Sig.
Pair1 after and before	21	0.946	0.000

**Table 6.** Paired sample test.

	Paired differences				
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference	
				Lower	Upper
Pair 1 after - before	0.857	12.901	2.815	-5.015-	6.729

**Table 7.** Paired samples test.

	Paired differences		
	t	df	Sig. (2-tailed)
Pair 1 after-before	0.304	20	0.764

## DISCUSSION

In the present study, insect species varied in numbers during the two periods, before and after the Gulf War. This can be attributed to many reasons:

### Disappearance or extinction due to habitat destruction

The dung beetle, *Menematium rotundipenna* and *Scarabaeus sacer*, (Coleoptera - Scarabaeidae), have undergone extinction due to soil compacting caused by gravel quarrying, camping and vehicles. These species are used to burrowing in soft soils and the compactness of the soil resulted in their loss of burrowing activity and hence has been replaced with other species that can dig in compacted soil.

### Disappearance or extinction due to removal of shelter plant

The jewel beetle, *Juloides distincta* (Coleoptera -Buprestidae), uses the perennial shrub *Rhanterium epapposium* (Compositae) as its shelter plant. These shrubs have been removed to establish a new city in their place and also as consequences of the Gulf War activities.

### Disappearance or extinction due to removal of food plants

The African lime butterfly, *Papilio demodocus* (Lepidoptera - Papilionidae) feeds on citrus which was not any more planted in many farms in Kuwait.

### Threatened with extinction due to removal of food plants

The monarch butterfly, *Danus chrysippus* (Lepidoptera - Danaidae), feeds on the milk weed, *Callotrophis procera* (Asclepiadaceae), which in the process of being removed from Kuwait due to its toxicity to birds and small mammals or due to urbanization.

The painted lady butterfly, *Vanessa cardui* (Lepidoptera - Nymphalidae), feeds on the shrub, *Rhanterium eppapsium*, which has been reduced in number in the desert of Kuwait due to camping, human use for fuel, gravel quarrying and the Gulf War .

### Threatened with extinction due to the destruction of habitat

The aquatic beetles, *Agabus consperus*, *Colymbetes piceus*, *Cybister tripunctatus*, *Eretes sticticus*, *Herophydrus musicus* and *Hydroglyphus singnatellus*

(Coleoptera - Dytiscidae)) and *Gyrinus distinctus* (Coleoptera - Gyrinidae), and aquatic bug, *Corixa lateralis* (Hemiptera - Corixidae), survive in the temporary rain pools produced after good rain in desert depressions. However Kuwait was subjected to severe draught lately and hence these rain pools have not been established any more. Another reason for rain pools destruction is the establishment of new cities in their localities.

### Flourished species in the new habitats

The dung beetle, *Scarabaeus cristatus* (Coleoptera - Scarabaeidae), can dig in compacted soil and therefore flourished in the new habitat and replaced the previously mentioned dung beetles.

The Indian weevil, *Rhynchophorus ferrugineus* (Coleoptera - Curculionidae), survived and became a serious pest of imported date palm trees because during the invasion of Kuwait, all of the local date palm trees were dead and after liberation, date palm trees have been imported from neighboring countries.

These imported palm trees carry on them this beetle, which have been adapted to the new habitat in Kuwait.

The diadem, *Hypolimnas missippus* (Lepidoptera - Nymphalidae), feeds on many planted trees in farms established after the Gulf War.

Statistical analysis showed that,  $F = 0.946$ , which means that the number of insects collected after 1992 is highly correlated or dependent with the number of insects collected after 1992, the  $p$ -value = 0.764 indicated that there is no significant difference between the two periods.

## Conclusions

The results of this study are in agreement with those of Peek (1986) who reported that living organism's habitat can be influenced by burning cover which in turn may be beneficial or detrimental with short-term responses.

According to UNEP rapid assessment report (UNEP, 1991), war activities have considerable direct and indirect effects on Kuwait` fauna and that oil spills near the burning wells will inevitably lead to the eradication of all living organisms within a wide area around these wells. Chew et al. (1959) and Owen (1985) had also reported earlier that heat generated by oil fires reduce population density of insects.

UNEP (1991) reported that war activities have a great deleterious effects on the environment by, for instance, destroying the habitat and food resources.

It has been reported (Zaman, 1998) that plant species in Kuwait have responded to this change.

Changes in insect numbers in Kuwait is not significant, it seems that insect species that disappeared were replaced with new insect species adapted to the new habitat existed after the War. In the other hands, insect

biodiversity varies before and after the War, this can be seen from the different species existing in the two periods, it is beyond the scope of this paper to list all the species names, but the reader can be referred to the author's publications listed below for insect list recorded before the War, and for the insect list recorded after the War, the author is recently preparing a new list for future publication.

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## REFERENCES

- Al-Houty W (1989). Insect fauna of Kuwait. Kuwait University, pp: 187
- Al-Houty W (1997). Checklist of the insect fauna of Kuwait. Kuwait J. Sci. Eng., 24: 145-162.
- Al-Sdirawi F (1994). The Impact of the Gulf War on the Desert Ecosystem. In the Gulf War and the environment, El-Baz F, Makharita RM (eds.) Gordon and Breach science publishers. USA.
- Al-Sulaimi J, Viswanathane MV, Szekely F (1993). Effects of oil pollution on fresh ground water in Kuwait. Environmental geology, 22: 246-256.
- Chew RM, Butterworth BB, Grechman R (1959). Effects of fire on the small mammal's population of chaparral. J. of mammalogy, 40: 253.
- Fowler SW, Readman JW, Oregioni B, Villeneuve JP and McKay K (1993). Petroleum hydrocarbons and trace metals in near shore Gulf sediments and biota before and after the 1991 war. An assessment of temporal and spatial trends. Mer. Pollut. Bull., 27: 171-182.
- Misak RF, Al-Awadhi J, Al-Sudairawi M (2001). Assessing and controlling land degradation in Kuwait desert. In the impact of environmental pollution on development in the Gulf region, Al-Sarawi M, Massoud MS (Eds.). Environment Public Authority. State of Kuwait.
- Owen OS (1985). Natural resources conservation, an ecological approach. Macmillan Publishing Company. New York.
- Peek JM (1986). A review of wildlife management. Englewood Cliffs, New Jersey. Prentice – Hall.
- UNEP (1991). Rapid assessment of the impacts of the Iraq-Kuwait conflict on terrestrial ecosystems. United Nations Environment Programme – Regional office for west Asia, pp: 11.
- Zaman S (1998). Impact of the Gulf War on Kowari's desert flora and soil. In sustainable development in arid zones, Omar's, Misak R, Al-Ajmi D (editors) Balkema AA/ Rotterdam. Brookfield. Netherlands.