CHAPTER 6

COMMUNITY STRUCTURE OF SPIDERS IN CASTOR AGROECOSYSTEM

INTRODUCTION

Castor (*Ricnius communis*) is an important industrial oilseed crop. Castor finds a place of prestige in the cropping systems of dry-land agriculture in semi-arid zones of India, because of its deep root system, drought hardiness, and quick growth. India occupies the second prestigious position in world's castor market after Brazil (FAO Stats, 2004). India also exports substantial part of its total castor produce to earn foreign exchange. Castor oil finds a number of uses for domestic, medicinal and industrial purposes. Castor oil is unique in its chemical composition. Castor oil is considered as one of the best lubricants and is extensively used in the manufacture of lubricants. About 3,000 tons of castor oil is consumed in the manufacture of soaps. Castor oil and its derivatives are used in the manufacture of disinfectants such as phenyls. Use of castor oil as a purgative is well known. Castor oil is used in many veterinary uses. It is used externally as an emollient.

The world area and production statistics for castor seed are fluctuating every year. The main castor seed producing countries are Brazil, India, the U.S.S.R., and Argentina. The castor plant grows throughout India up to an elevation of 2500 meters. Andhra Pradesh, Gujarat, Orissa and Karnataka are the important castor growing states. Of the total production, nearly 70 per cent comes from the state of Gujarat. Castor crop is important in Junagadh, Nawanagar, Kutch, Ahmedabad, Surat, East Khandesh and Kaira areas of Gujarat. Castor crop are mostly raised as a pure crop. If sown as mixtures, it is mixed with cotton, jowar, bajra and sesame. Sowings are done in June-July and harvesting in December to February.

Between 1974-75 and 1993-94 the total production of castor in the country shot up from 2.1 to 6.4 lakh tonnes, while the productivity levels rose from 356 to 934 kg/ha. Despite phenomenal increase witnessed in the production and productivity of castor over the last ten years, there still exist wide regional disparities in the per hectare yields of castor. A multitude of factors such as its cultivation in submarginal and marginal lands under rainfed conditions with practically little or no inputs, use of poor quality seed and inefficient crop management are responsible for such dismal yield.

World Area, Production and Productivity during 2005

Country	Area in Ha	Production in 000, tonnes	Yield in Kg/ha
World	1,409,79	1,393,812	988
Angola	13,500	3,500	259
Brazil	214,751	176,743	823
China	270,000	268,000	993
India	800,000	870,000	1087

FAO STAT Citation

Area, Production and Yield of Castor in India (2002 - 03)

State	Area in 000' Ha.	Production in 000' Tonnes	Productivity (qtls/ha)
Andhra Pradesh	227	85	3.8
Gujarat	242	283	11.7
Karnataka	17	14	8.2

Bihar	5	3	6.0
All India	585	428	7.3

Source: Statistical Abstract

Farm management and the Pesticide input for Castor is minimum and this agroecosystem represents an ecosystem with minimum human interference. A number of insect pests are known to cause economic loss to the farmer (Ayyar, 1963). The prominent among them is the Castor Semilooper (Achoea *janata*) and castor capsule borer (*Dichocrocis punctiferalis*). The insect pests attacking Castor are *Helicoverpa armigera* which feeds on leaves as well as the capsule. The other leaf feeding pests are *Spodoptera litura, Bemesia tabaci, Amsacta albustriga,* Jassids (*Dicladispa armigera*) etc. These leaf feeding pests indirectly cause economic loss by reducing the crop vigour and affecting the yield. A part from the above phytophagous pests the other insects found in less numbers is short horned grasshopper.

A number of natural enemies have been found to be present in the castor fields. The parasitoids include a variety of Hymenopteran parasitoids which parasitize larvae, pupa of the noctuid moth. The predominant parasitoid present in the field belonged to *Apanteles* sp (personal observation). Spiders were the dominant and diverse predators found in castor and in other agroecosystems (Wise 1993; Turnbull 1973; Nyffeler and Benz, 1987; Greenstone, 1999, Symondson et al, 2002)

The principal management technique of pest management in castor is the application of insecticides (Ayyar, 1963; Patel and Gangrade, 1971) for controlling the lepidopteran attack. The castor semilooper (*Achoea janata*) and the capsule-borer (*Dichocrocis puntiferalis*) are the two most serious pests of castor. Dusting Fenvelerate (0.4%) in early stages or spraying 0.44% Ekalax (0.1%) or Carbary1 or 0.05% Parathion on the crop will give an effective control of these pests. The Problem of the residual effects of pesticides is a known fact hence a need to develop IPM modules which is lacking for the crop and also biological control of the insect pests in castor is needs to be given importance.

Studies pertaining to the natural enemies have been mainly restricted to the parasitoids (Teotia and Chaudhari, 1960; Pandey, 1969) while no study has been done regarding the predators in castor and their feeding potential in the crop pests. Hence a detailed study on the Community Structure, Ecology and diversity of spiders in castor was under taken. I had following set of objectives for studying spiders in castor. (1) Checklist of spiders found in Castor agroecosystem. (2) Seasonal dynamics of Spider families in the cropping season. (3) Population dynamics of dominant spider species found in castor. (4) Correlation with the microclimatic factor affecting the population density of Dominant spiders. (5) Species diversity measures and spatial distribution of spiders in the castor field.

RESULTS

Species Composition

During the two seasons a total of 484 individuals, belonging to 29 genera and 10 families (Annexure 1c). The most abundant families were from web builder guild. A total of 63 species of spiders belonging to 10 families were found during the both the seasons. The majority of the spiders were from the weaving guild. Family Araeneidae, Clubionidae and Therrididae were the most dominant and diverse families found in both the cropping years. The numerical abundance of the spiders was from the family Clubionidae in both the years composing of 25.62% and 41.12% respectively Phase I and Phase II respectively.

Six spiders were found to be new and require further identification. The majority of the spiders were from Web Building guild (50 %) as compared to Hunters (50%). The most numerically abundant spiders were from the family Clubionidae (25.62 % in Phase I and 41.12% in Phase II) in the hunting guild (Table 6.2) and Araeneidae (21.35 % in Phase I and 29.43% in Phase II) and Therrididae (22.06 % in Phase I and 22.89% in Phase II) from weaver's guild. The mean number of spiders per 10 leaves per plant ranged between 14-28. Spider diversity (Shannon – Weiner index) at family level ranged between 1.99 – 2.76 across all cropping season in Phase I and 1.57 – 2.59 in Phase II. While the Shannon – Weiner index between the cropping years was between 3.11 and 2.93 in Phase I and Phase II respectively.

Seasonal Dynamics of the dominant families of spiders

Family Clubionidae showed the maximum dominance during the month of February during Phase I (Graph 6.3) and during the month of November in Phase II (Graph 6.4). These two months coincided with the flowering and maturation of the seed in the castor bean plant. Araeneidae showed the maximum dominance during the later phases of the crop.

The percentage composition of spiders in two cropping seasons (Graph 6.3 and 6.4) shows that three families of spiders were numerically abundant. These families are Araeneidae comprising about 21.35% in Phase I and 29.43% in Phase II. Clubionidae comprised about 25.62% in Phase I and 41.12% in Phase II and Therrididae comprising 22.06%, in Phase I and 22.89% in Phase II. In Phase II the population of Araeneidae kept a steady decline from the start of the cropping season (78.94%) till the maturation of the crop (25.26%).While in the year Phase I, Family Araeneidae increased in numbers from start (24.69%) of the cropping season till the fruiting of the crop (33.4 %). The population of Clubionidae during Phase I remained constant (30.06%) from the start of the cropping season (December) till capsule formation season (February) and then decreased to 13.27%. In Phase II the population of Clubionidae increased from 15.78%, the start of the cropping season (September) till 39.28% till the flowering stage of the crop (November) and maintained a steady density till the end of the cropping season. The Population of Therrididae gradually increased and reached its peak 33.4% and 37.9% in Phase I and Phase II respectively.

Population Dynamics of dominant spiders

8 species of spiders belonging to three families namely Clubionidae, Araeneidae and Therrididae represented the numerically abundant species in castor in Phase I and Phase II.

Family Clubionidae

In family Clubionidae 3 species of spiders namely *Cheiracanthium melanostoma, Clubionda drassodes and Clubiona filicate* were numerically abundant during the whole of the cropping season (Graph 6.10a and 6.10b).

a. *Chieracanthium melanostoma*

The mean density of *Chieracanthium melanstoma* was above 3 per 10 leaves per plant throughout the cropping season in Phase II. graph 6.10b (Phase II) shows the population dynamics of the Clubionids, whereas *Chieracanthium melanostoma* showed a steady buildup of population from the Month of October till the end of cropping season (January), during the same time the population of white flies in the castor was at its maximum in the month of January, showing that the buildup of *Chieracanthium melanostoma* may be in response to the increase in the density of white flies. Similar Pattern of increase in the population was observed during the earlier year also graph 6.10a (Phase I). The presence of white flies in the sac web of the *Chieracanthium melanostoma,* confirmed that the white flies formed the major composition of diet of these spiders.

b. Clubiona drassodes

Clubiona drassodes also showed a steady increase by making its appearance in the month of September Graph 6.10b (Phase II) and reaching its peak density in the month of the January (Maturing of the fruit). Similar pattern was seen during Phase I (Graph 6.10a) also, except that during the month of March the spiders were absent. Thus in the early and late sowing of castor the essential difference is the absence of spiders in late sowing crop in the maturation stage of the crop.

c. Clubiona filicate

The population of *Clubiona filicate* was comparatively lower than the two mentioned above, showing a peak density of 1.5 individuals per 10 leaves per plant. The Clubionidae genus has been observed to feed on the noctuid larvae present in these crops. The populations build up was similar in both the cropping years (Graph 6.10a and 6.10b), showing that the crop architecture and prey spectrum might influence the build of population of these spiders.

d. Castaneria zetes

Castaneria zetes showed numerical abundance during the Phase I, reaching its maximum density in the month of January coinciding with the Pre – flowering stage of the crop. However in Phase II, the population buildup was not significant.

B. Araeneidae

Three species of spiders namely *Argiope anasuja* , *Zygeilla melanocornia* and *Zygeilla indicus* ,were numerically abundant Araneidae in Phase I (Graph 6.7a). While in Phase II (Graph 6.7b), *Neoscona mukerjei* replaced *Zygeilla indicus* in the numerical abundance while the rest of the species remaining the same.

a. *Argiope anasuja*

The population of *Argiope anasuja* increased from the start of the cropping season and reached the peak density at the flowering stage and fruiting stage of the crop which was in the month of December and January (Phase II) and Late January till early march (Phase I).

b. *Zygeilla melanocornia*

The Population reached its peak during the vegetative stage (January) and the flowering stage (February) of the crop in Phase I (Graph 6.7a). However in Phase II (Graph 6.7b), the peak population was observed at the start of the cropping season and with the progress of the cropping season the density decreased and was absent at the end of the cropping season.

c. *Zygeilla indicus*

The Population was steady from the start of the cropping season reaching peak density during the month of the February (2004-05) i.e. Capsule formation stage and was absent in the later months. In the subsequent cropping year we did not find *Zygeilla indicus* in high numbers.

d. *Neoscona mukerjei*

The population was at its maximum during the start of the cropping season (Phase II) and gradually decreased in the subsequent month and was became absent with the start of the flowering season. This initial high build up of the population might be due to emigration from the neighboring cotton field in response to the appearance of Larvae of *Spodoptera litura* in the Castor crop.

C. Therrididae

Three species of Therridids were numerically abundant during both the cropping years;these were *Theridion manjithar, Argyrodes projeles and Argyrodes gazades* (Graph 6.8a and 6.8b).

a. *Theridion manjithar*

These spiders build small irregular webs along the base of the leaf stalk and between the leaf tips. The peak density of the Flowering and Fruiting stage of the crop in both the years. The peak density of 4 per 10 leaves per crop was observed in both the years.

b. *Argyrodes projeles*

This Therridid showed a gradual increase in the density reaching its peak density during the end of the cropping season, the web of this spider was observed and showed the presence of white flies in its webs. Hence it is an important predator of the white flies.

c. Argyrodes gazades

This spider was present in almost constant density throughout the cropping season during Phase I (Graph 6.8a). During the subsequent year it did not show any consistency in its population.

Species and Generic Diversity

In the year Phase I (2004-05), four families of spiders represented with more than five species in the castor crop (Annexure 1c). These families are Araeneidae consisting of 6 genera and 12 species followed by Clubionidae comprising of 3 genera and 10 species, Salticidae having 4 genera and 6 species and lastly Therrididae having 3 genera and 6 species respectively. In Phase II (2005-06) Family Araeneidae represented with 5 genera and 14 species forming the most diverse family in the castor bean agroecosystem, followed by Clubionidae with 4 genera and 8 species and Therrididae with 2 genera and 5 species. Altogether in both the cropping years the relative constitution of the generic and species diversity were from the families Araeneidae , Clubionidae and Therrididae in the decreasing order of their diversity respectively.

Five species richness estimations were used namely Shannon – Weiner Index, Simpson Index, Margalef D, Berger -Parker Index, Fisher Alpha were used for measuring the species diversity of the spiders. For measuring the evenness, equitability index was used. The Year Wise values are given in the Table 6.4 and the month wise values are given in the Table 6.3a and 6.3b.

The diversity of spiders in Phase II (Table 6.3b)was maximum during the vegetative stage of the crop (H = 2.592; D= 19.773) when the crop about 60 days old to the flowering stage (H = 2.73; D= 17.182) of the crop. In Phase I (Table 6.3a) during the same stages of the crop the values of diversity indices are also high (H = 2.73; D = 11.92) and (H = 2.76; D = 12.47). The Evenness index during the vegetative stage and flowering stage of the crop in both the years were (0.712-0.720). Showing that the during these stages of the crop the diversity of spiders is also high and most of the spiders show higher densities also thus the values of the H , D and Evenness in both the years are almost similar. This view is further substantiated by the Berger –Parker Index which shows high value for community having a few spiders having very high density as compared to others, the B-P Index in both the years shows that during the late vegetative stage (Pre –flowering stage) and during flowering stage the values are between 0.172-0.227 in Phase I and between 0.133 – 0.214 in Phase II (Table 6.3a and 6.3b) which are comparatively less as compared to the early and later stages of the crop. The Species number during the above mentioned stages are between 24-28 (Phase I) and 15-17 (Phase II).

Comparison of diversity among the seasons shows that the months October and November (Phase II) shows maximum diversity in terms of Simpson D and Shannon Weiner H index having significantly more diversity at $P < 0.05$ level. Similarly in Phase II the Diversity in of the months January and February shows the significantly higher diversity at $P < 0.05$ level. The Diversity Ordering among the various cropping months in Phase II (Graph 6.14) confirms our earlier calculation that months October and November show greater diversity as compared to the other months and January and February in Phase I (Graph 6.13).

The Rank abundance of the spiders in both the cropping years (Phase I and Phase II) shows that the about six species of spiders contribute numerically to the spider community (Graph 6.11 and 6.12) and the remaining spiders are found either in singleton or in doubleton.

Table 6.1a: Percentage composition of the Dominant spider families– Phase I

Family	Dec	Jan	Feb	Mar
Araneidae	24.69	19.67	29.68	33.4
Clubionidae	30.06	27.04	34.40	13.27
Linyphiidae	7.9	21.31	07.82	6.63
Therrididae	25.85	28.68	12.53	33.4
All others	12.0	3.27	15.55	13.27

Table 6.1b: Percentage composition of the Dominant spider families– Phase II

Family	Sept	Oct	Nov	Dec	Jan
Araneidae	78.94	43.75	35.71	25.0	25.26
Clubionidae	15.78	21.87	39.28	32.14	34.74
Therrididae	0	15.62	21.42	35.71	37.9
All others	5.26	18.75	3.5	7.14	2.08

Table 6.2: Percentage composition of total spiders in various families

Family	Percentage occurrence	
	Phase I	Phase II
Araeneidae	21.35	29.43
Clubionidae	25.62	41.12
Therrididae	22.06	22.89
Linyphiidae	12.81	0.014
All others	18.14	0.05

Table 6.3a: Species Diversity and Evenness Measures – Phase I

Diversity Measure	Dec	Jan	Feb	Mar
H	2.52± 0.02	2.73±0.00	2.76±0.01	1.99±0.03
D	6.4228	11.924	12.471	13
Evenness	0.65652	0.71065	0.71697	0.51726
Fisher alpha	13.382	10.12	13.568	8.8553
Berger - Parker	0.375	0.17213	0.22727	0.23077
Species Number				

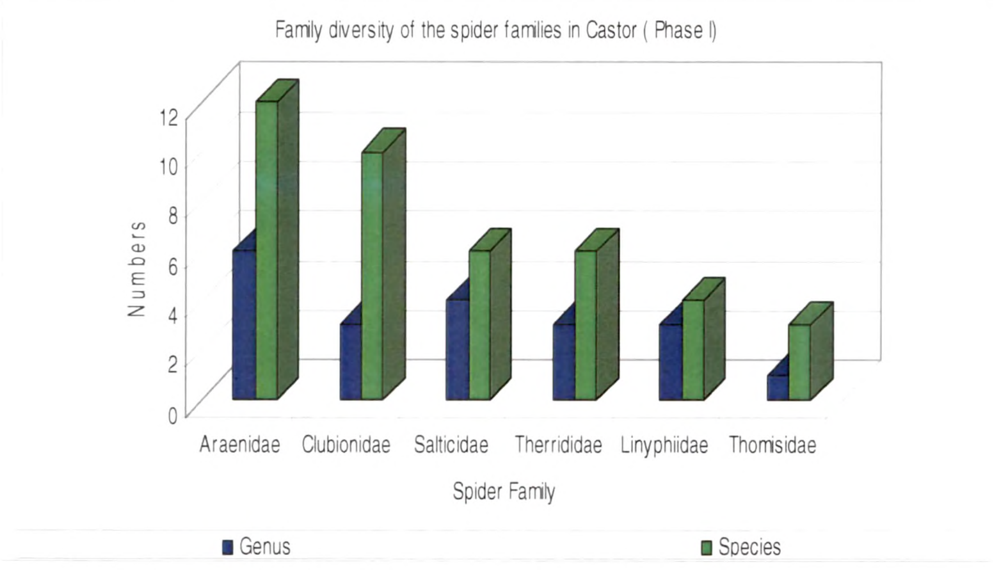
Table 6.3 b: Species Diversity and Evenness Measures – Phase II

Diversity Measure	Sept	Oct	Nov	Dec	Jan
H'	1.57 ± 0.02	2.59 ± 0.01	2.59 ± 0.01	2.43 ±0.01	2.24 ±0.02
D	4.75	19.773	17.182	8.6019	6.9805
Evenness	0.43326	0.71258	0.7237	0.67019	0.61731
Fisher alpha	3.0197	11.939	18.342	9.0053	7.6819
Species Number	6	15	17	20	16
Berger – Parker	0.42105	0.13333	0.21429	0.21622	0.31481

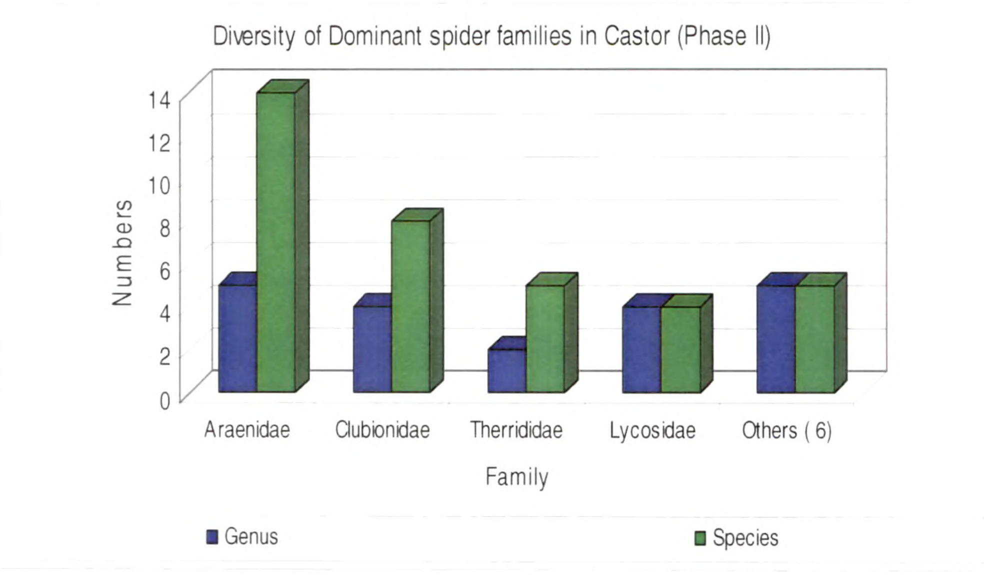
Table 6.4: Alpha Diversity Measures of spiders in both the Cropping Phases

Diversity Measure	Phase I	Phase II
Shannon Weiner	3.1172	2 9399
Simpson Index	16.26	12.03
Margalev index	8.12	6.77
Equitability \Evenness	0.75	0.70
Fisher Alpha	16.12	13.24
Species number	47	37
Berger- Parker	0.12	0.21

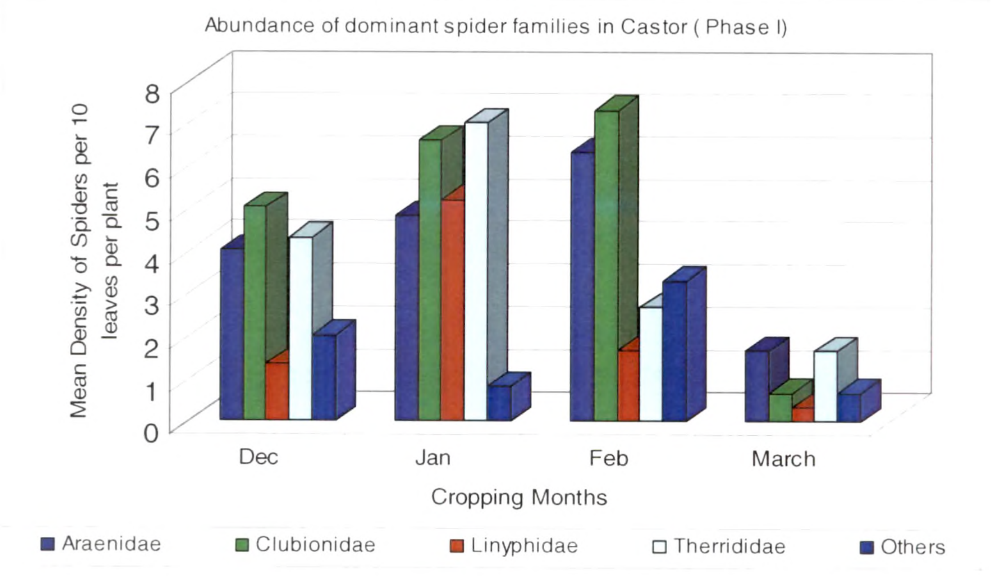
Graph 6.1: Generic and Species diversity of spider families - Phase I



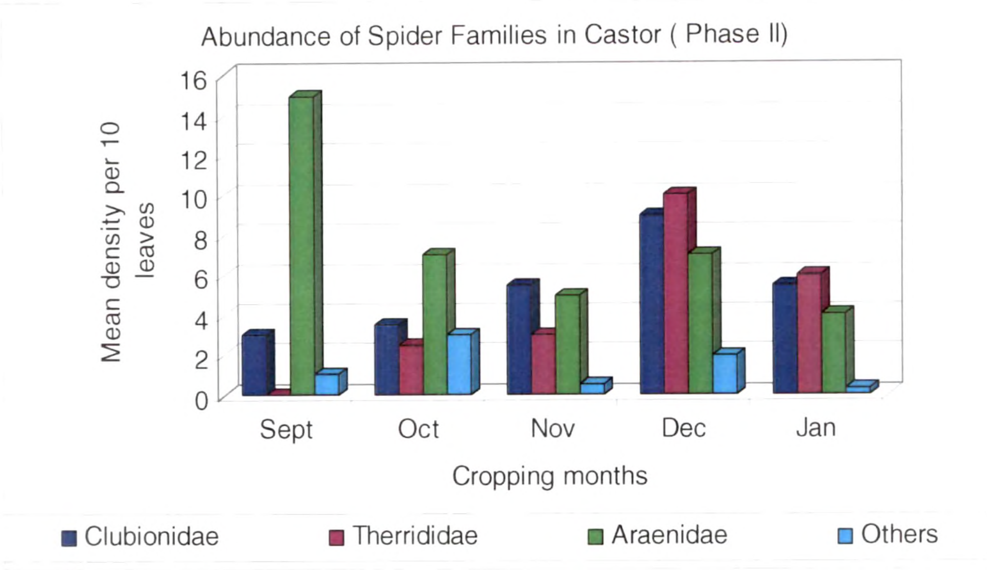
Graph 6.2: Generic and Species diversity of spider families - Phase II



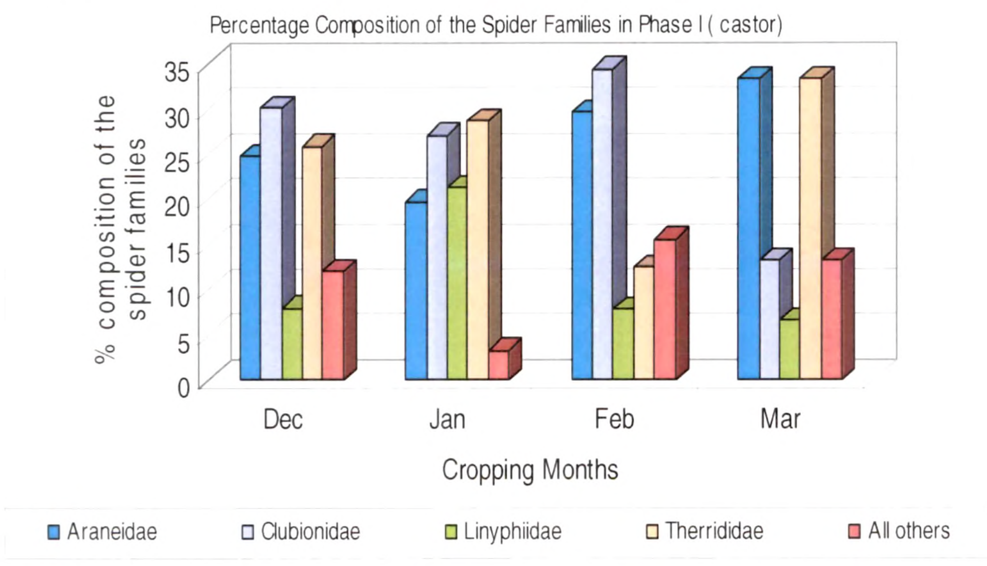
Graph 6.3: Relative abundance and Density of spider families – Phase I



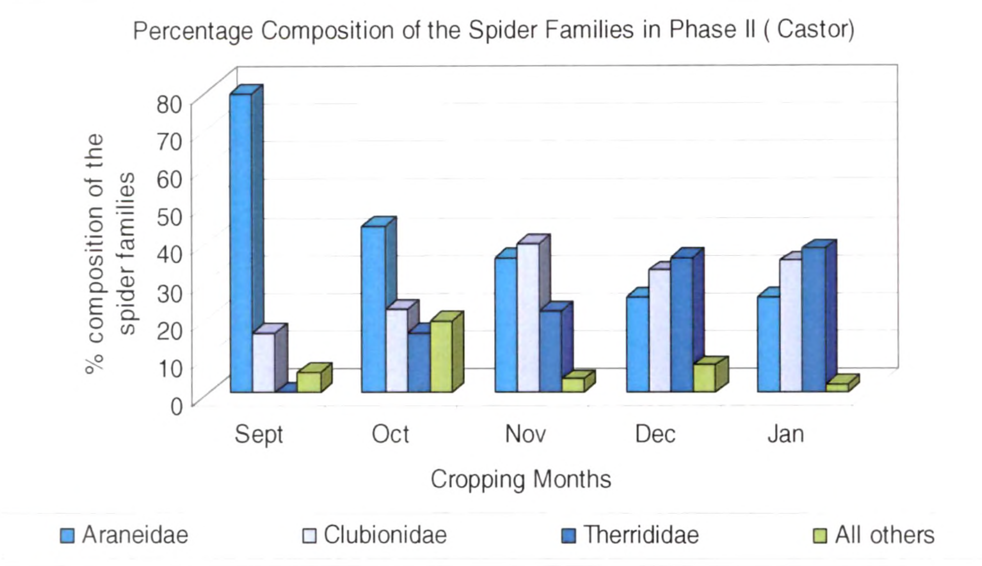
Graph 6.4: Relative abundance and Density of spider families – Phase II



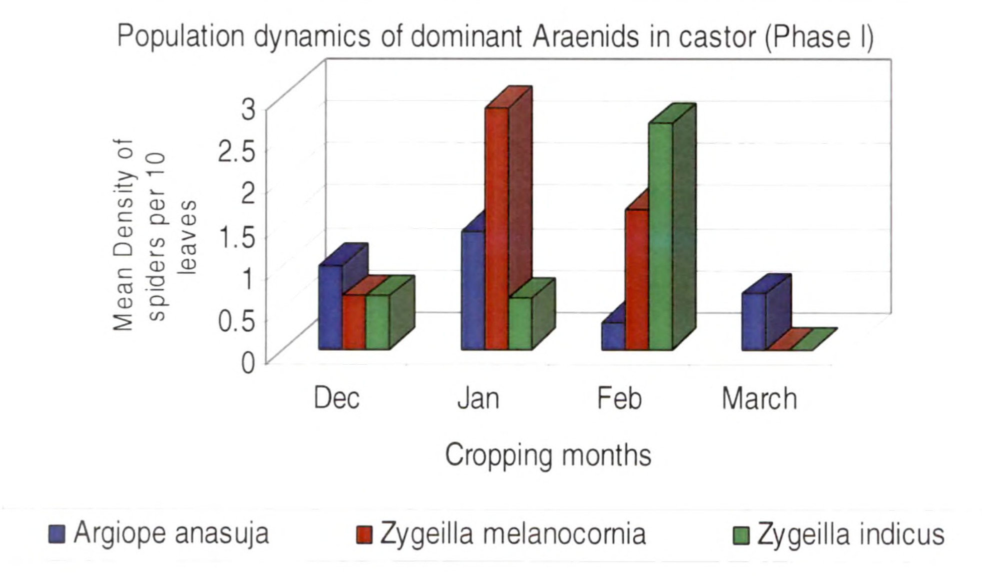
Graph 6.5: Percentage composition of the Spider Families – Phase I



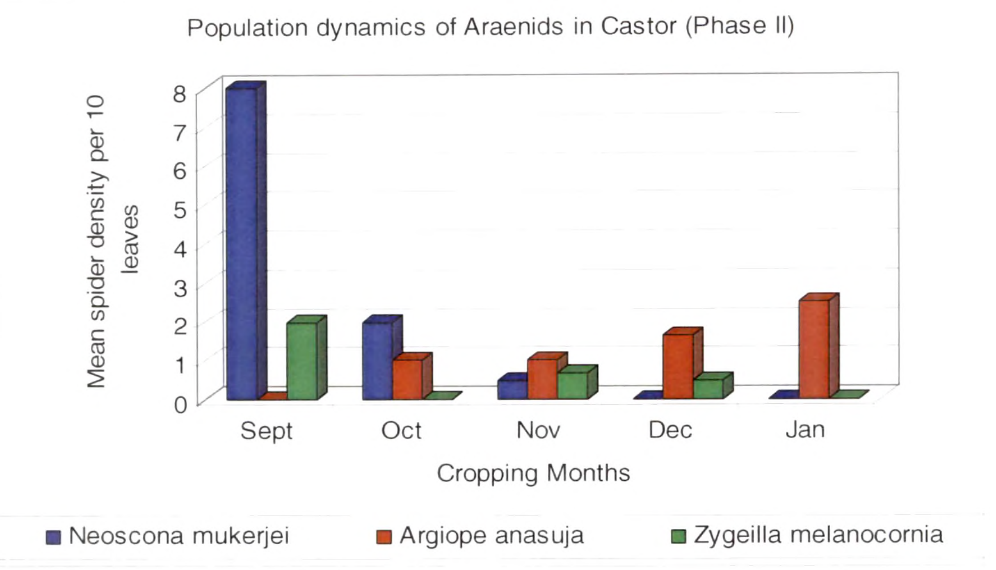
Graph 6.6: Percentage composition of the Spider Families – Phase II



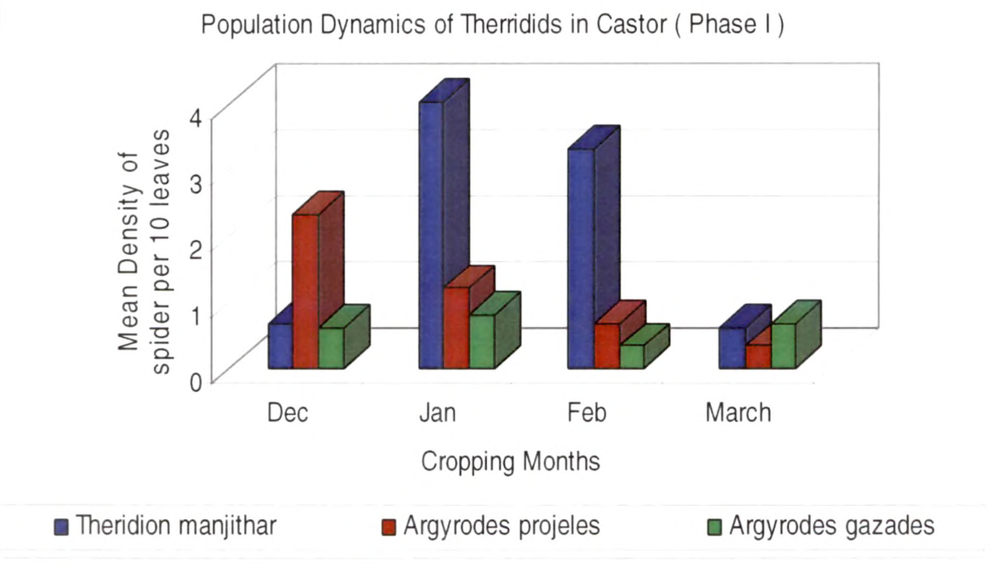
Graph 6.7 a: Population Dynamics of Spiders of Family Araeneidae – Phase I



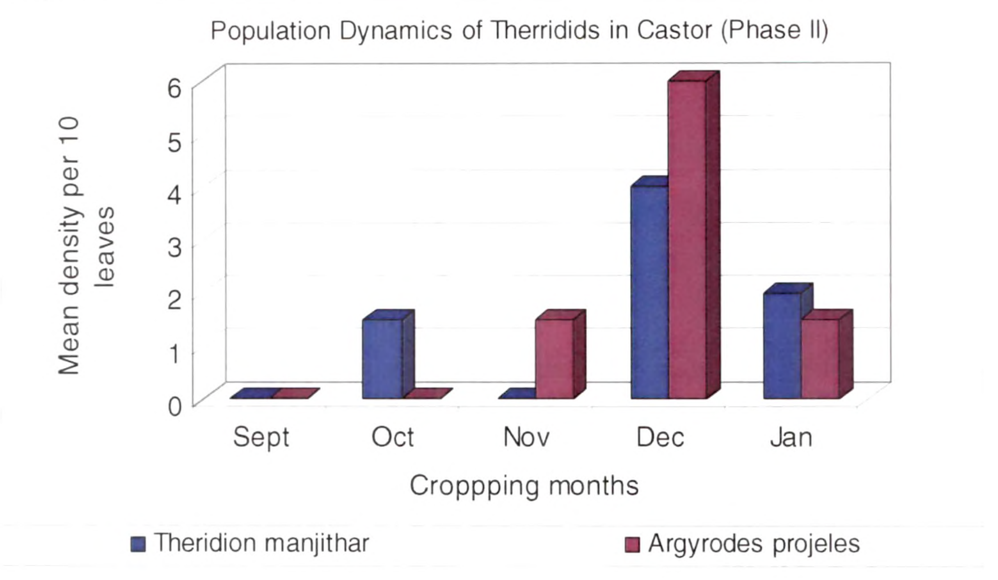
Graph 6.7 b: Population Dynamics of Spiders of Family Araeneidae – Phase II



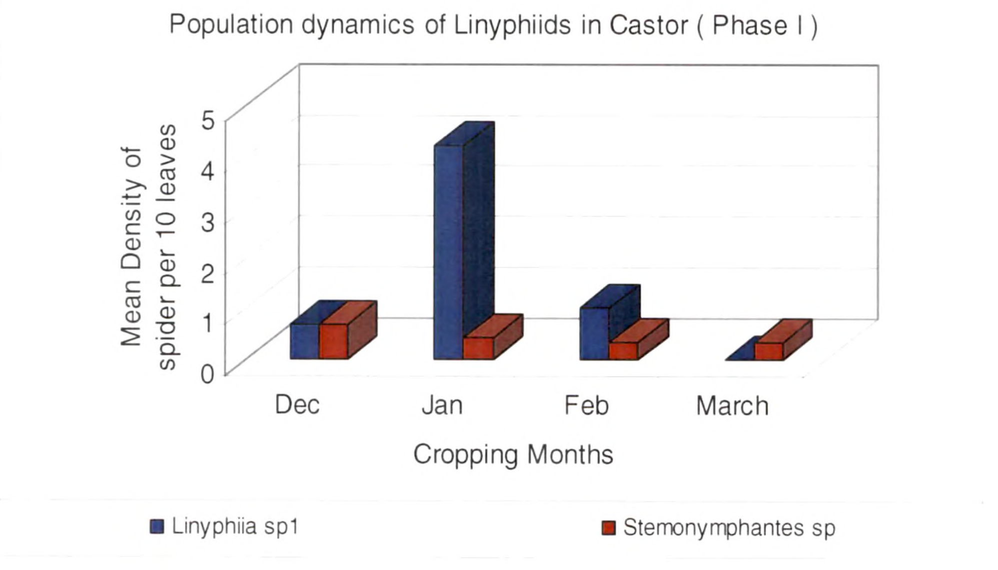
Graph 6.8 a: Population Dynamics of Spiders of Family Therrididae: Phase I



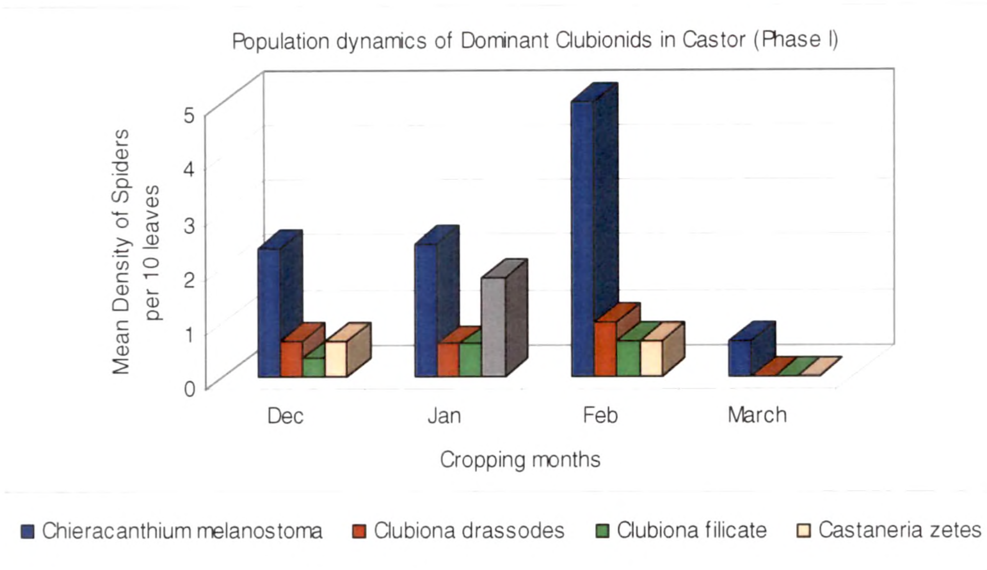
Graph 6.8 b: Population Dynamics of Spiders of Family Therrididae: Phase II



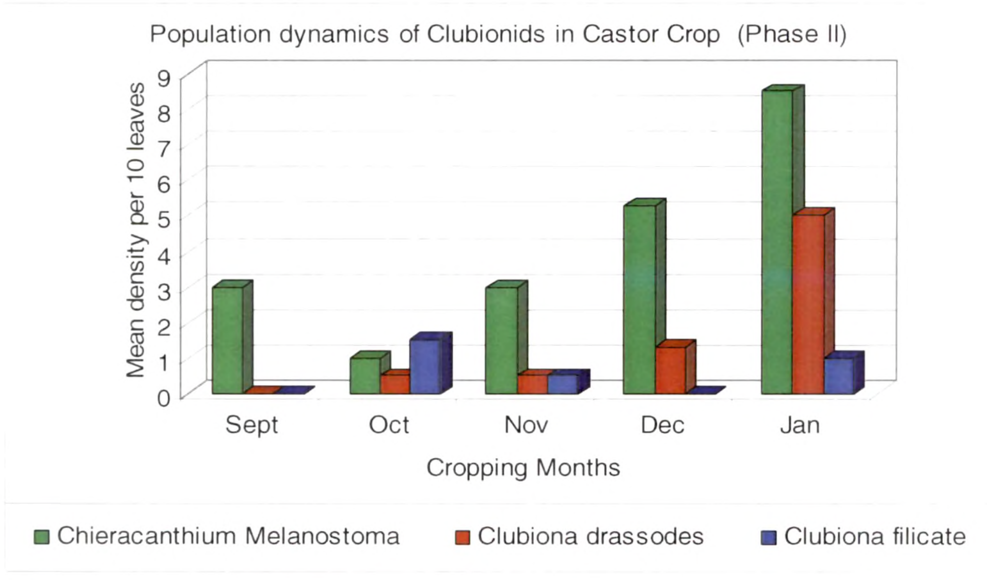
Graph 6.9: Population Dynamics of Spiders of Family Linyphiidae: Phase I



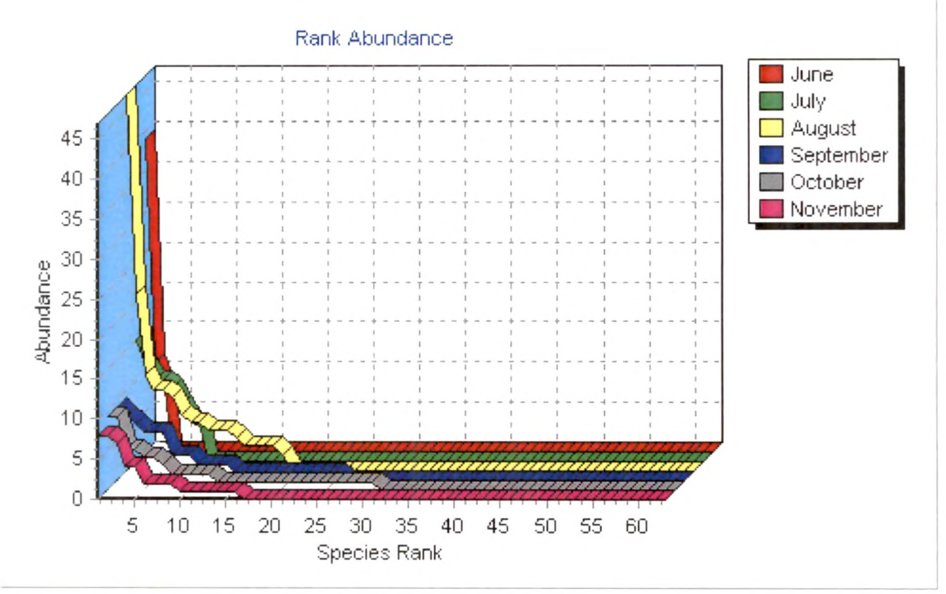
Graph 6.10a: Population Dynamics of Spiders of Family Clubionidae: Phase I



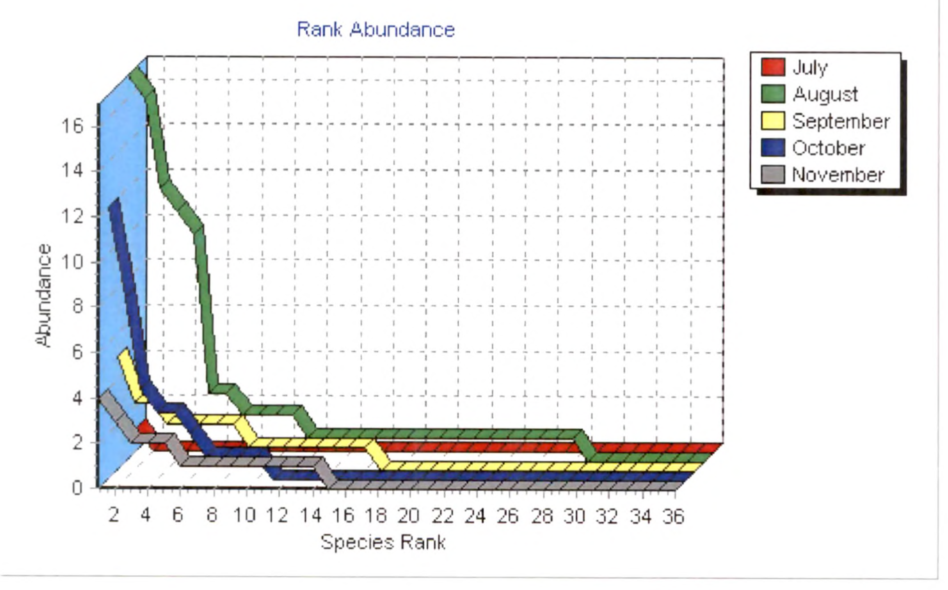
Graph 6.10b: Population Dynamics of Spiders of Family Clubionidae: Phase II



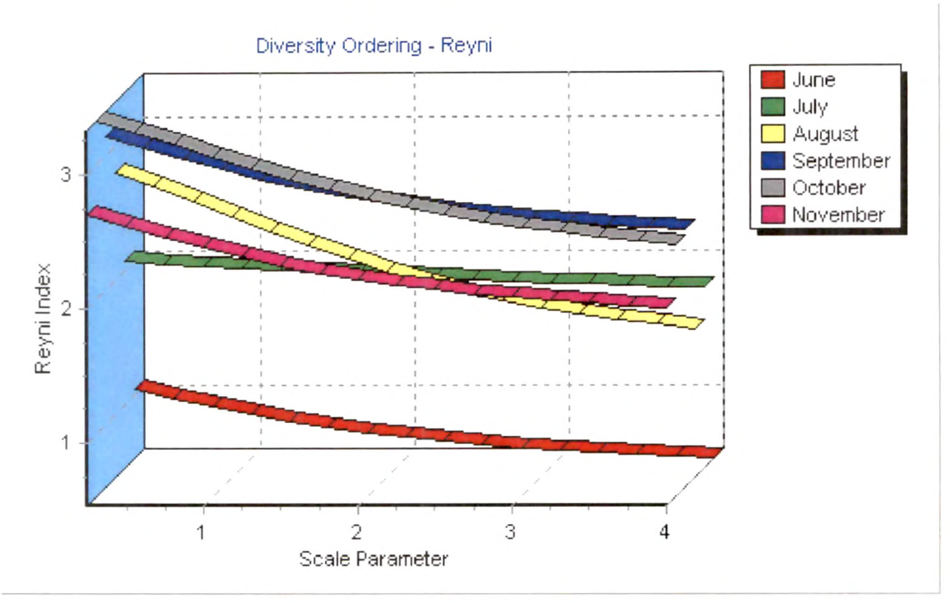
Graph 6.11: Rank Abundance of Spiders – Phase I



Graph 6.12: Rank Abundance of Spiders – Phase II



Graph 6.13: Rank Abundance of Spiders – Phase I



Graph 6.14: Rank Abundance of Spiders – Phase II

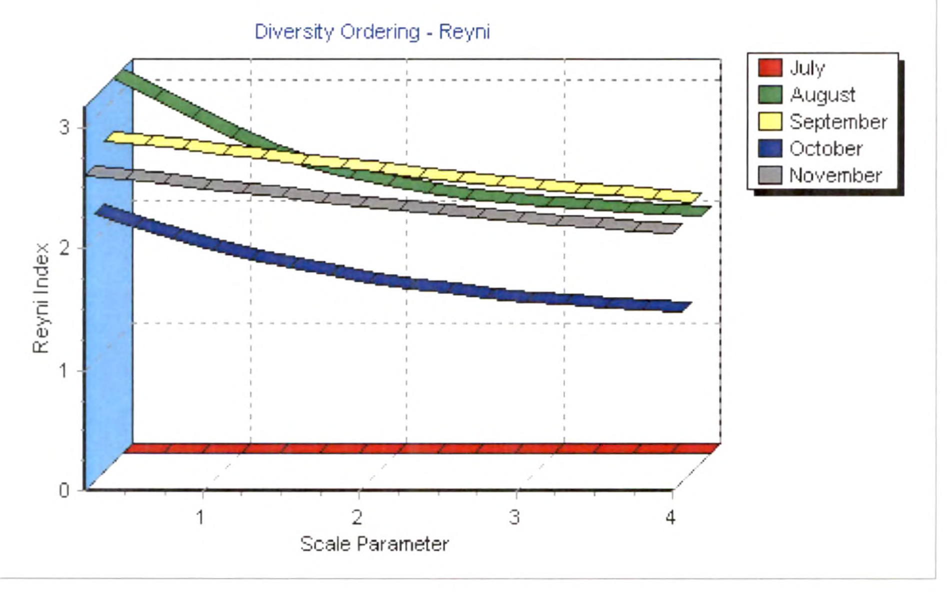


PLATE XXIV

SITE SHOWING THE EXPERIMENTAL FIELD AND THE ADJOINING FEILDS

EXPERIMENTAL PLOT AND ADJOINING GEOGRAPHICAL FEATURES

PLATE XXV

CROPPING STAGES OF CASTOR

VEGETATIVE STAGE OF CASTOR CROP

FLOWERING STAGE OF CASTOR

PLATE XXVI

Clubionids mainly controlling lepidopteran larvae and white flies

Araneids on field margins

CLUBIONA DRASSODES (SAC SPIDER)

ORB WEB SPIDER CATCHING THE INSECT PREY

PLATE XXVII

Eggs of Chrysoperla sp., a predator

Coccon of Apanteles, a parasitoid

EGGS OF GREEN LACEWING ON CASTOR LEAF

APANTELES COCOON IN THE DRIED LEAVES OF CASTOR PLANT

PLATE XXVIII

Spodoptera litura on field margins

Hairy caterpillar skeletinising the castor leaf

ACHOEA JANATA (CASTOR SEMILOOPER)

SHORT HORNED GRASSHOPPER IN CASTOR

PLATE XXIX

Larva of moth damaging the vegetative stage of Castor crop

Grasshopper cuts the leaf of castor leaf

SPODOPTERA LITURA (ARMY WORM LARVAE)

AMSCATA ALBUSTRIGA IN CASTOR

DISCUSSION

Castor represents an industrially important crop, fetching foreign exchange to India (FAO STAT 2001). The medicinal usage of castor oil and the manuring usage of castor cakes make it an important crop in terms of the direct use to humans. The usage of pesticides in castor to control insect pests can be eliminated by the development of Biological control using Predators and parasitoids. Spiders are an important component of biological control in natural and in agroecosystem (Richert and Lockley, 1984; Marc et al, 1999; Wise, 1993). The baseline data regarding the ecology and assemblages of spiders in castor along with the knowledge of the factors affecting the population buildup of spiders can go a long way in the successful incorporation of spiders in biological control.

The biodiversity of spider community in castor agroecosystem of Baroda is represented by 10 families of spiders constituting 63 species were reported from castor in the two cropping years. Family Clubionidae, Araeneidae and Therrididae contribute more number of species than any other family. The density and diversity of spiders in castor agroecosystems shows a predominance of web building spiders and foliage hunters as against other agroecosystem like pigeonpea and paddy. In paddy and pigeon pea agroecosystems the numerical abundance is contributed by hunting spiders belonging to family Lycosidae, Salticidae and Oxyopidae. This predominance can be attributed to the crop architecture of castor.

The distance between the two rows of castor plants is about 80-100 cms and the distance between the adjacent plants is about 40-60 cms. These two features create a gap at the ground level though with the progress of the cropping season the canopy becomes confluent with each other. The wide spacing of castor plants gives less space for hiding for the hunting spiders belonging to the Lycosidae. The other reason attributed to the low density of lycosidae is decreased soil moisture. Members of the family lycosidae are more prone to desiccation and castor is a crop of arid region and it requires very less irrigation thus soil moisture. Thus it may seem logical for the low density and diversity of spiders in castor. In terms of the forage availability at, the ground level offers less profitable and few numbers of insect pests. The insects' pests of castor are represented by the mainly capsule borers (*Amsacta albustriga*) and the leaf feeders (*Achoea janata*) which are found on the aerial parts of the plant. The foliage hunting spiders like Clubionidae and Salticidae have better chances of finding prey and hence the abundance and the species diversity of these two spiders family are huge. Clubionidae (Sac spiders) build their webs along their leaf margins by curling the tips of the leaf while Salticidae are found along the dorsal and ventral sides of the leaf. In web building spiders of Therrididae the web sites for the attachment of their webs are provided by the curvy and irregular leaf margins, thus these spiders are found along margins on dorsal and ventral surfaces of the leaf. The members of family Araeneidae build their webs in between two leaves or in the flower crown or between the leaf and stem of the plant.

The population dynamics of dominant spiders and their correlation with environmental factors shows that in the family Clubionidae, 3 species of spiders are dominant; the changes in their density were correlated with Soil temperature, Relative Humidity and microclimatic atmospheric temperature. I found that the all the three species of spiders showed a significant negative correlation with the Atmospheric temperature ($P < 0.10$). When the density of the all the species of Clubionids were correlated with abiotic factors it showed that a significant negative correlation with temperature ($P < 0.10$). The above study shows that both temperature and relative humidity has an inverse effect on the population dynamics of Clubionids.

In the family Araeneidae *Neoscona mukerjei and Argiope anasuja* showed significant negative correlation with soil temperature. But looking at the above ground habitat of the Orb-weavers it may seem that the soil temperature doesn't play an important role in the distribution of the spiders. Though it may be argued that the microclimatic humidity might be influenced indirectly by soil temperature. In the case of *Argiope anasuja* a significant correlation with the relative humidity ($P<0.05$) In terms of family Araeneidae are significantly influenced by temperature ($P < 0.10$). The population of Therridids is not significantly influenced by abiotic factors. Thus is the population fluctuation in Therridids may be due to the availability of the insect prey or due to some its normal life cycle. The buildup of the population of Therridids is during the December later on in the season the population decreases, the temperature from the December to the harvesting of in March, shows a gradual increase. On the basis of the above it might be possible that increasing temperature is not conducive for the survival of Therridids. Therridids have been known to be an important component of spider community in Winter wheat in Europe and United states (Symondson et al, 2002). While in the Indian context the population of Therridids shows an irregular trend.

Seasonal dynamics of spider families

Thus with respect to the seasonal dynamics of spider families and population dynamics of dominant spider individuals it seems that the spider assemblages in castor agroecosystems are significantly affected by a multitude of abiotic factors, these factors usually have a universal impact on the member of the representative families though some anomalies still exist.

The species diversity and richness of the spiders in castor shows that the diversity during the month of February (Phase I) about 50 day old crop is at its maximum (H =2.76; D =12.47) The dominance of individual species during the cropping season shows that during the month of December (Phase I; Days = 0-30) the species diversity is low and the Berger- parker dominance index is high.

In Phase II, the castor was sown as a early crop. It was seen that from the sowing stage (September) the diversity of the species was low and few species were represented by high numbers, thus the Berger-Parker dominance index was high (0.42), while the corresponding values of H and D were low. The most stable Evenness index (Q) for the month of

November was maximum, along with it the values of H and D are also high as compared to the other cropping months.

In Phase I, the Values of D and H were maximal during January and February, the corresponding values of Q also showed high values (Q = 0.71) (Table 6.3a). This shows that the relative abundance of individual spider species were almost the same during January and February.
The diversity measures of the two cropping seasons shows that during the start of the cropping season the diversity is low and the dominance of a few species is high. The reasons for the above are due to the availability of the web sites in the early stage of the castor is meager, Lack of adequate foliage cover for foliage hunting spiders and absence of insect pests.

It is a known fact that the assemblages of the spider species can contribute in a significant way in the conservation biological control of insect pests (Richert and Lockley 1985, Nyffeler 1988; Greenstone 1999.). Thus in terms of studying the spider diversity and abundance coupled with the knowledge of the prey spectrum of individual spider species can contribute to our understanding of the impact of various factors on the aggregation and dispersal of spiders. The above knowledge can be utilized in the identification of the habitat specific spiders and the ways to conserve them.