

Review paper

Ants' way of teamwork: Some management concepts behind it.

S. Paulraj*

Chennai Snake park, Raj Bhavan Post, Chennai - 600022, Tamilnadu, India.

Abstract

A review of research on team works performed by some group of social ant species has been carried out and evaluated with reference to some concepts of teamwork followed in our modern management. Some of the team works performed by the ants are far superior to our modern principles of teamwork management and could be taken as lessons from nature.

Keywords: ants, management concepts, social life, teamwork

INTRODUCTION

We started following certain concepts of Nature for our organizational management about two decades back. Frosch and Gallapoulos (1989) and Frosch (1992) developed the concept of Industrial Ecosystem, which led to the term Industrial Ecology. The idea of an industrial ecology is based upon a straightforward analogy with natural ecosystems. Then came the emerging field of industrial ecology, the industrial symbiosis wherein the concept of symbiotic relationship occurring among the living things is extended to the industrial management (Chartow, 2000). Recently, the migratory behavior of geese has been scientifically analyzed and the principles of group behaviour are cited widely as lessons for a successful teamwork (Anonymous, 2008).

But, no further scientific attempts have been made to analyze the behaviours of many such organisms although, wealth of such information available on animal behavior is voluminous and, there are vast scopes for applying the useful information for the betterment of our life and for the management of an organization. Therefore, the object of this present paper is to find some of the very interesting animal (undomesticated wildlife) behaviours that have got some application value for better understanding of our modern organizational management.

The most suitable animal model taken up for the present work is social insects. Among social insects ants have some of the most sophisticated systems to facilitate cooperation that occur among animal societies (Holldober, 1985,1986) and, they have efficient team formation (Franks, 1984). Teamwork in ants has been studied in detail and a good number of findings are

reported by many authors (Franks, 1986; Kube and Bonabeau, 2000; Franks *et al.*, 2001 and Skimmer, 2005) Therefore, the earlier studies on teamwork behavior of ants are taken up for analyses to bring out the concepts behind the teamwork and the lessons to be learnt for improving our teamwork efficiencies in our present day management.

HYPOTHESES ANALYSED

Over the years teamwork has gained a lot of prominence at the work place (Srikrishna, 2009). The Webster's New world dictionary defines teamwork as "a joint action by a group of people, in which each person subordinates his or her individual interests and opinions to the unity and efficiency of the group." The term teamwork in management science is defined as follows: "The term team work is the capability to comprehend and recognize the diverse strength and abilities in a group setting and then applying them to the final solution" (by Dr. Gregotti and Dr. Sirosis from the Oxford university of Belarus – *en. Wikipedia.org/wiki/Teamwork*). In order to test the management concepts behind the teamwork among ants, some management hypothesis on teamwork have been chosen from some popular articles on teamwork management (Chanania, 2009, Srikrishna, 2009). The findings made on teamwork of ants by several authors are analyzed in order to find out how far the findings support the hypotheses. The following hypotheses are proposed for testing.

Hypotheses

1. The basic characteristic of a team is the constitution of diverse talents.
2. Right mix of talents ensures team success.
3. Team spirit is not about competition but, cooperation.
4. Joint efforts in a team results higher output and synergic effect.

*Corresponding Author
email:paulrajifs@gmail.com

5. In a team, members are free to focus on what they are good at, leaving the rest to others with distinct skill.

REVIEW OF EARLIER STUDIES AND FINDINGS ON THE ABOVE HYPOTHESES

Hypothesis 1. *The basic characteristic of a team is the constitution of diverse talents.*

The work of Franks, (1985) on army ants reveals that, there are four distinct worker morphs are involved in teamwork. They are: majors, sub-majors, medium workers and minors. There is a clear division of labour among them. In the worker team, there is a large sized front runner who initiate prey retrieval and one or more small sized workers called followers to assist the fore runner. Hence, there are qualitatively different sub-tasks that must be performed concurrently during such teamwork. Another worker group called sub-major, the next to largest worker group, specialize in the role of prey retrieval, *i.e.*, they form a "porter" group (Frank, *et al.*, 2001). Jaffe *et al.*, (2007) also found similar traits in the army ant *Eciton burchelli*. The above studies reveal that there is a teamwork among the army ants and there are diverse talents among worker groups with some morphological specialization.

Hypothesis 2: *Right mix of talents ensures team success.*

In the task of prey retrieval in the army ants, the front runner is the largest of the group and the next followers are the smaller ones. No followers that follow the front runner are as big as front runner. This implies that the second largest ants in the team are small not because only small ones are available but, because large ants choose not to become employed this way. That is, "if an unnecessarily large ant tries to help a front runner (another large ant) and finds that the remaining works is too light to employ her full efforts she does not join the team. One or more smaller ants whose efforts are fully employed become involved instead" (Franks *et al.*, 2001). Thus, there is a specified mix of talents with one front runner and one or two followers.

Another best example for the right mix of talents among ants' group is revealed from the study of Gu *et al.*, (2008). They found out that for killing a large prey the army ants employ more number of smaller ants than the larger ants as the smaller ants are specialized for the task of killing while the larger ants are specialized for other tasks like carrying the prey.

Hypothesis 3: *Team spirit is not about competition but, cooperation.*

One of the important factors that has enabled the ants to become so dominant and abundant is their division of labour. In their colony the Queen, a highly specialized female, carries out reproduction for the colony. Whilst the remaining task of colony maintenance, brood care and foraging are all taken on by their workers. This

www.bvgt-journal.com

may seen an unfair, feudalistic relationship, which at first glance make little evolutionary sense. Natural selection is a process, through which fitter individuals have improved survival, the queen specializes in laying eggs, and the workers are freed from reproductive duties, which allow them to concentrate on other tasks. This leads to exceptional colony efficiency (Brodie, 2009). Here, there is no competition among the colony members for attending a particular work meant for somebody and, therefore, the team spirit in the colony is not about competition but, cooperation.

Hypothesis – 4. *Joint efforts in a team results higher output and synergic effect.*

The efficiency of the teamwork may be decided by the output and it is expected that the output of the team should be higher when compared to the total output by the team members' individual output. In this respect the work of Moffett (1988) offers an interesting observation. He demonstrated that a group of about 100 ants, *Pheidolegeston diversus*, was able to transport a 10 cm. earthworm weighing 1.92 g (more than 5000 times as much as a single 0.3 – 0.4 mg minor worker ant) at 0.41 cm/s on level ground. By comparison, ant engaged in solitary transport of food items on the same trail were carrying burdens weighing almost five times their body weight at about 1 cm/s: this means that ants engaged in the cooperative transport of the earthworm were holding at least 10 times more weight than did solitary transporters, with only a comparatively modest loss in velocity (Moffett, 1988). In this task, the application of mechanical engineering principal is worth comparing.

The above findings reveal that the cooperative transport is more effective in terms of total output than the sum of output by the same number of team members individually.

Hypothesis 5: *. In a team, members are free to focus on what they are good at, leaving the rest to others with distinct skill*

In army ants, the large ants called sub-majors, are specialized for carrying bigger prey and smaller preys are left to be carried by small workers. According to Franks, (1985), many medium sized and large prey items are carried by sub-majors in the ant species, *Eciton burchelli*, which act as specialist porter castes. In an experiment with that species, it is observed that, in 56% of 32 trial, a single ant, which in 89% of the cases was a sub-major, carried off the item unaided, replacing the efforts of two ants of similar (combined) weight (Franks *et al.*, 2001). Thus, the sub-majors are free to focus on what they are good at it by carrying only the larger prey and leave the smaller prey to the small workers.

Such specialization among worker ants is very distinct and interesting in leaf cutter ant species. The leaf cutter ants are the masters of task specialization and show the greatest size differences between worker groups in

the ant world. Huge major workers cut leaves and carry them to the nest, whilst tiny minor workers work inside the nest, chewing the leaves and using them as a substrate upon which to cultivate a fungus, which with feed the colony (Brodie *et al.*, 2009). Here, the major workers are free to focus on the task of cutting and carrying the prey in which they are specialized and they leave the task of chewing into small pieces is left to the minor workers in which the latter have distinct skill.

DICUSSION

All the five hypotheses taken up for testing are all basic requirements for a successful team and teamwork (Srikrishna, 2009 and Chanania, 2009). The various findings described above on teamwork in ants are all supporting all the five hypotheses on teamwork tested in this paper. Teams were first demonstrated by Franks (1986) in insect societies. Among all animal groups, the insects group is the largest in terms of species number and diversity. Among the insect groups, ant group is the most dominant group and demonstrates some of the most sophisticated examples of social behavior (Brodie *et al.*, 2009). Many reasons may be attributed for their success in the evolutionary history. One of the reasons may be their colony life and teamwork evolved among them (Brodie, *et al.*, 2009).

Evolution of teamwork among animal kingdom is seen among various independently evolved groups. For example, such teams occur during hunting in Chimpanzees, African wild dogs, Lions, Harris' hawks etc., (Franks *et al.*, 2001). This shows that how the division of labour in the hunting team among these individuals leads to greater efficiency. Thus, teams are formed out of necessity for increasing efficiency and success rate.

As far as the human beings are concerned it is said that, the early humans used brain power, innovation and teamwork to dominate the planet (Despain, 2010). Thus, teamwork was an important factor in human civilization. Probably, early human might have learnt the teamwork from the animal groups surrounding them.

Knowing the importance of teamwork many organizations are going on perfecting the teamwork management and come with several principles of teamwork in different fields: - Sports, (Yukelson, 1997), Health, (Clements *et al.*, 2005 and Skinner, 2005) and General (Murphy, 1998). The ants' way of team work discussed above is invariably found in all these fields. Whilst perfection of our teamwork management is an endless and developing process, how can a perfect and successful teamwork is performed and maintained generation by generation in animals like ants is surprising. One answer is the animal's instinct behavior which is genetics based that evolved over millions of

years. In this regard, the finding of Fjerdingstad and Crozier (2006) reveals that, in ants, high genetic variation combined with a genetic component to worker caste determination increases homeostasis in systems with complex system of labour.

CONCLUSIONS

The basic principles of teamwork were analyzed with reference to teamwork found in ants by various researchers. All the five principles tested are in agreement with the teamwork practiced in ants. As the existence of teamwork found in ants is much earlier to the human origin and, it had evolved over millions of years and found effective for better survival of the species in ants, the ways of teamwork found in the ants could be taken as lessons and also as viable principles for an effective teamwork in any of our field of management.

REFERENCES

- Anonymous, 2008. A lesson from geese on health, safety, security, leadership and teamwork. <http://www.authorstream.com/Presentation/vkaisthaaseem-67676-Teamwork-Slide>
- Brodie, J., Lee, Y., Stevens, S. Bareham, G. 2009. High societies, the secrets within an ant colony. *Explorer's Inn Newsletter*, June – July, 2009.
- Chanania, P. 2009. Team spirit is not about competition but cooperation. *The Hindu, Daily, Chennai edition, Opportunities: 3*; September 9, 2009.
- Chartow, M. R. 2000. Industrial symbiosis: Literature and taxonomy. *Annu. Rev. Energ. Env.*, 25: 313 -337.
- Clements, D., Dault, M. and Priest, A. 2005. Effective teamwork in Healthcare: Research and Reality. *Healthcare Pap.*, 7 (sp): 26-34.
- Despain, D. 2010. Early Humans used Brain Power, Innovation and Teamwork to dominate the Planet. *Sci. Am.* February 27, 2010.
- Franks, N.R. 1985. Reproduction, foraging efficiency and worker polymorphism in army ants. In: Holldobler, B. and Lindauer, M. (Ed.), *Experimental behavioral ecology and sociobiology*, vol. 31. Sinauer, Sunderland Press, U. K. P. 91-107.
- Franks, N.R. 1986. Teams in social insects: group retrieval of prey by army ants (Eciton burchelli, Hymenoptera: Formicidae). *Behav. Ecol. Sociobiol.*, 18: 425 – 429.
- Franks, N. R., Franks, A. S. and Anderson, C. 2001. Division of labour within teams of New world and Old world army ants. *Anim. Behav.* 62: 635-642.
- Fjerdingstad, E. J. and Crozier, R. H. 2006. The evolution of worker caste diversity in social insects. *Am. Nat.* 167: 390-400.

- Frosch, R. A. 1992. Industrial Ecology: A Philosophical Introduction. *Proc. Natil. Acad. Sci., U.S.A.*, 89: 800-803.
- Frosch, R. A. and N. Gallapoulos. 1989. Strategies for manufacturing. *Sci. Am.* 261:94-102.
- Gu, Y., Lobben, T. J., Chang, T. D. and Cheek, I. M. 2008. Murder by numbers: The efficiency of army ant castes. In: Peart, D. R. (Ed.), *Dartmouth Studies in Tropical Ecology. Department of Biological Sciences, Dartmouth College, Hanover, New Hampshire.*
- Holldobler, B. 1984. Evolution of insect Communication. In: Lewis, T. (Ed.), *Insect communication. Academic Press, London.* P. 349-371.
- Jaffe, R., Kronauer, J. C., Kraus, F. B., Boomsma, J. J. and Moritz, R. F. A. 2007. Worker caste determination in the army ant *Eciton burchelli*. *Biol. Lett.* 3: 513-516.
- Kube, C. R. and Bonabeau, E. 2000. Cooperative transport by ants and robots. *Robot. Auton. Syst.*, 30: 85-101.
- Moffett, M.W. 1988. Foraging dynamics in the group hunting myrmicine ant *Pheidologeton diversus*. *J. Insect Behaviour.* 1:309-331.
- Murphy, J. J. 1998. Pulling together: The seven principles of effective teamwork (Successories Library). *Venture Management Consultant / Successories, Inc. CA, U.S. A.* P. 43.
- Skinner, N. 2005. Developing Effective Teams. In: Skinner, N., Roche, A. M., O'Conner, J., Pollard, Y. and Todd, C. (Ed.), *Workforce Development TIPS (Theory into Practice Strategies): A Resource kid for the Alcohol and other Drugs Field. National Centre for Education and Training on Addiction (NCETA), Finders University, Adelaide, Australia.* P. 2-16.
- Srikrishna, N. P. 2009. Right mix of talent ensures team success. *The Hindu, Daily, Chennai edition, Opportunities:* 3; July 22, 2009.
- Yukelson, D. 1997. Principles of effective team building interventions in sport: A direct service approach at Penn State University. *J. Appl. Sport Psychol.*, 9: 73-96.