



Research Report

Behavioral study of free-roaming dogs in temples in Nakhon  
Ratchasima

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การศึกษาพฤติกรรมสุนัขจรจัดภายในวัด ในจังหวัดนครราชสีมา  
Behavioral study of free-roaming dogs in temples in Nakhon  
Ratchasima

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คณะวิทยาศาสตร์และเทคโนโลยี  
มหาวิทยาลัยราชภัฏนครราชสีมา

งานวิจัยนี้ได้รับทุนอุดหนุนการวิจัยจากมหาวิทยาลัยราชภัฏนครราชสีมา  
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### บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาปฏิกิริยาของสุนัขจรจัดในวัดต่อคนที่เดินเข้าหา เก็บข้อมูลของสุนัขจรจัดในวัดจาก 5 วัด ข้อมูลที่เก็บได้แก่ พฤติกรรมของสุนัข, ลักษณะฝูงสุนัข (ตัวเดียว, เป็นคู่ และมากกว่า 3 ตัว) ระยะตอบสนองต่อการเข้าหา (0-2 เมตร, 2-5 เมตร และมากกว่า 5 เมตร) และพฤติกรรมการตอบสนอง (ลักษณะปกติตามธรรมชาติเมื่อไม่มีสิ่งรบกวน การหลีกเลี่ยง การก้าวร้าว การเปล่งเสียง การเคลื่อนไหวของหาง) เก็บข้อมูล 2 ครั้งคือ ครั้งที่ 1 ดำเนินการในสัปดาห์ที่ 1 หลังจากนั้นผู้ทดสอบพยายามให้สุนัขคุ้นเคยโดยการให้อาหารและลูบตัวสุนัขสัปดาห์ละครั้งเป็นเวลา 3 สัปดาห์ แล้วเก็บข้อมูลครั้งที่ 2 ในสัปดาห์ที่ 4 ผลการวิจัยพบว่า ในสัปดาห์ที่ 1 มีสุนัข 40 ตัวและ สุนัขในสัปดาห์ที่ 4 มีสุนัข 43 ตัว สุนัขมากกว่า 60% อยู่ตัวเดียวและมากกว่า 50% ของสุนัขนอนลงก่อนการทดสอบ ปฏิกิริยาของสุนัขในสัปดาห์ที่ 4 มีความแตกต่างอย่างมีนัยสำคัญจากสัปดาห์ที่ 1 ( $P < 0.05$ ) ในสัปดาห์ที่ 4 จำนวนสุนัขที่ตอบสนองอย่างเป็นธรรมชาติและจำนวนที่เข้าหานักทดสอบเพิ่มขึ้นและในทางกลับกันจำนวนที่หลีกเลี่ยงการสัมผัสและเห่าก็ลดลง การเคลื่อนไหวของหางมีความแตกต่างอย่างมีนัยสำคัญระหว่างสัปดาห์ที่ 1 และสัปดาห์ที่ 4 ( $P < 0.05$ ) ในสัปดาห์ที่ 4 จำนวนสุนัขที่ตอบสนองและเปล่งเสียงลดลงอย่างมีนัยสำคัญ ( $P < 0.05$ ) สุนัขมากกว่า 69.2% ตอบสนองต่อผู้ทดสอบในระยะทางมากกว่า 5 เมตร อย่างไรก็ตามไม่พบความแตกต่างอย่างมีนัยสำคัญระหว่างสัปดาห์ที่ 1 และ 4 ของการสังเกต ( $P = 0.06$ ) กล่าวโดยสรุปพฤติกรรมของสุนัขในวัดได้รับผลกระทบจากความคุ้นเคยกับคนที่เข้าหา แต่การศึกษาครั้งนี้เป็นเพียงการศึกษาครั้งแรก ดังนั้นจึงจำเป็นต้องมีการวิจัยเพิ่มเติมเกี่ยวกับสุนัขจรจัดโดยใช้วิธีทดสอบต่อคนแปลกหน้าต่อไป

<b>Research Title</b>	Behavioral study of free-roaming dogs in temples in Nakhon Ratchasima Municipality
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### Abstract

The aims of this study were to investigate the reactions of temple dogs to strangers by means of a stranger-approach test. Behavioral data of temples dogs were collected from 5 temples. The dogs' behaviors, number of dogs together (alone, in pairs and with >3 dogs), reaction distances (0-2m, 2-5m and >5), and reaction behaviors: neural, avoidance, aggressive, vocalization, approach and tail movements were all observed. All the reaction behaviors recorded were the dogs' initial reactions. After the 1<sup>st</sup> stranger-approach test, which was conducted in the 1<sup>st</sup> week, the observer tried to get the dogs used to him by feeding and grooming them once per week for 3 weeks. Then the 2<sup>nd</sup> stranger-approach test was conducted in the 4<sup>th</sup> week. The results showed that 40 dogs were observed in the 1<sup>st</sup> week's observation and 43 dogs in the 4<sup>th</sup> week's observation. More than 60% of the dogs were alone and more than 50% of the dogs were lying down before the test. The dogs' reactions in the 4<sup>th</sup> week were significantly different from those in the 1<sup>st</sup> week ( $P < 0.05$ ). In the 4<sup>th</sup> week, the number of dogs that reacted neutrally and the number that approached the researcher increased and, conversely, the number that avoided contact and barked decreased. The tail movements showed a significant difference between the 1<sup>st</sup> week and 4<sup>th</sup> week of observation ( $P < 0.05$ ). In the 4<sup>th</sup> week, the number of dogs which reacted and vocalized decreased significantly ( $P < 0.05$ ). More than 69.2% of the dogs reacted to the observer at a distance of >5m, however, there was only a marginally significant difference between the 1<sup>st</sup> and 4<sup>th</sup> week of observation ( $P = 0.06$ ). In conclusion, the reaction of the dogs was affected by their familiarity with the people who approached them. This is the first study of the reaction of temple dogs to people in Thailand. Therefore, further research on stray dogs using the stranger-approach test is necessary.

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## Chapter 1 Introduction

### 1.1 Rational of this study

Stray dogs (*Canis familiaris*) have always been part of the developing world's landscape, but exploding populations, increasing attacks on citizens and spiraling rabies epidemics have transformed this issue from a third world problem to a global public health priority (Strand, 2011). A survey in 2018 found that there were 70,000 cats and dogs in the northeastern provinces of Thailand (Straits Times, 2018). In Thailand, where dogs are the animals most frequently reported as rabid, the disease is endemic and widespread (Kasempimolporn et al., 2007; Kasempimolporn et al., 2008; Kasempimolporn et al., 2011). Buddhist beliefs guide human-animal relationships in Thailand, and street dogs are not destroyed unless they are close to death (Nikki, 2013). Many Thai temples commonly receive stray cats and dogs from surrounding communities. The euthanasia of sick or unwanted animals is strongly discouraged due to religious beliefs and therefore abandoned animals are commonly left at temples. Songpol (2017) reported that the temples in Thailand are overwhelmed by abandoned dogs and cats which is causing a serious problem beyond their control. However, studies of stray dogs pertaining to their behavior, welfare and relationships with people are very rare in Thailand.

As indicated, reliable information on many aspects of the free-roaming dog population is lacking, and newspaper articles include much speculation based on personal experiences and observation (Fielding and Mather, 2000). There is rare information about the behavioral study of free-roaming dogs in temples. To obtain a wider understanding of the problem of free-roaming dogs, dog welfare, and in order to give a good suggestion of management the free-roaming dogs in temples for residents, therefore this research should be carried out.

### 1.2 Research objectives

- 1.2.1 To assess the health characteristics of dogs living in the temples.
- 1.2.2 To evaluate the attitudes of stray dogs in temples towards people by means of a stranger-approach test.
- 1.2.3 To find a suitable way to manage free-roaming dogs in temples in order to indicate the human-animal relationship between free-roaming dogs and human.

### **1.3 Research hypothesis**

1.3.1 The dog' characteristics will influence dog behavior and body condition.

1.3.2 The behavioral responses of temple dogs towards unfamiliar humans will be socialized.

### **1.4 Scope and limitation of the study**

In Thailand, where dogs are the animals most frequently reported as rabid, the disease is endemic and widespread (Kasempimolporn et al., 2007; Kasempimolporn et al., 2008; Kasempimolporn et al., 2011). Therefore, the most studies of free-roaming dogs focus on negative impacts on city environment and human health, such as the prevalence of GI parasites in dogs (Rojekittikhunet al., 2014), population problems (Naewna, 2013). Despite the complexity of issues surrounding free-roaming dogs, little work has been done to assess the relationship between free-roaming dogs and human. It is important to understand the dog-human relationship, in order to improve animal welfare and suggest a suitable way to manage free-roaming dogs in temples. This study will be the first attempt to assess the size of the free-roaming dog populations in Nakhon Ratchasima, Thailand.

### **1.5 Expected results**

The research results will contribute to give the information of dog population and welfare situation in temples to the Department of Livestock Development in the downtown of Nakhon Ratchasima. Understanding the behavioral responses of temple dogs towards humans, in order to give suggestions to residences to manage free-roaming dogs in temples.

### **1.6 Definition**

Free roaming dogs means any dog who roams-owned, cared for by a community or household, or surviving without human assistance is included (Fielding and Mather, 2000).

## Chapter 2

### Literature Review

#### 2.1 Stray dogs in Thailand

There are estimated to be over 9 million dogs and cats in Thailand. Thailand is rated 10<sup>th</sup> in the list of countries with the largest pet dog populations at 6.9 million. A Thai study of 1.94 million households found 20% raised dogs, of which 51.2% had 1 dog, 2.9% had 5 dogs and 0.6% had more than 10 dogs. In Thailand, the number of stray dogs and cats increases each year. The ratios of not-owned and owned dogs and cats are 1:7.6 and 1:4.4, respectively (11.6% of dogs and 18.6% of cats are not owned). Animal euthanasia is not acceptable to most Thai people, resulting in the establishment of several kinds of animal homes, refuges, pounds, guardian associations and foundations by the non-government sector. These include private/personal refuges run by dog and cat lovers, and although kind-hearted, these individuals are generally elderly citizens. These shelters rely completely on donations and sponsorship and are often unorganized operations. These combined issues may cause management and animal-healthcare problems. (Reviewed by Rojekittikhun et al., 2014).

Stray dogs (*Canis familiaris*) have always been part of the developing world's landscape, but exploding populations, increasing attacks on citizens and spiraling rabies epidemics have transformed this issue from a third world problem to a global public health priority (Strand, 2011). However, in Thailand 5,000 dogs are abandoned every year; in Bangkok alone, there are 0.82 million dogs kept as pets (Naewna, 2013). A survey in 2018 found that there were 70,000 cats and dogs in the northeastern province, Thailand (The Straits Times, 2018). The Department of Livestock Development (DLD) reported that the dog population is about 7 million and about 10% are stray dogs in 2017 (DLD, 2018).

Free-roaming dogs (*Canis Familiaris*) in developed and developing countries are a worldwide concern because of various dog-related problems, such as dog welfare, aggressive dogs, dog bites and transmission of zoonoses (Ruiz-Izaguirre E. et al., 2014). In Thailand, where dogs are the animals most frequently reported as rabid, the disease is endemic and widespread (Kasempimolporn et al., 2007; Kasempimolporn et al., 2008; Kasempimolporn et al., 2011). And the studies of the prevalence of GI parasites in dogs as well (Rojekittikhun et al., 2014).

It is well known that Buddhist beliefs guide human-animal relationships in Thailand. So, the Soi dogs (means street dogs) are not destroyed unless they are

close to death (Nikki, 2013). Many Thai temples commonly receive stray cats and dogs from surrounding communities (Mori et al., 2013). In Thailand, euthanasia of sick or unwanted animals is strongly discouraged due to religious beliefs and therefore abandoned animals are commonly left at the temple. Moreover, the unresponsiveness of the pet owners causes the number of abandon dogs increased. Songpol (2017) reported that the temples in Thailand are overwhelmed by abandoned dogs and cats which is causing a serious problem beyond their control. For the past two months, people in the district have abandoned more than 50 pet cats and dogs in the temple compound causing a lot of problems for the monks.

## **2.2 “Stray dog” is replaced by “free-roaming”**

Fielding and Mather (2000) explained that dogs generally are considered to be strayed if they roam and residents do not recognize them as theirs or a neighbor's. “Stray” is replaced by “free-roaming” so that any dog who roams-owned, cared for by a community or household, or surviving without human assistance is included. This definition includes all dogs who can contribute to the nuisances caused by free-roaming dogs (Fielding and Mather, 2000).

Free-roaming animals tend to be at least partly dependent on humans for their survival (such as for the provision of food) and people who interact with or care for these animals, but profess not to own them, are termed “semi-owners”. Although communities may benefit from semi-ownership (such as through opportunities for companionship and protection from vermin), semi-owned animals have a high risk of suffering and mortality through inadequate resource provision, untreated illness disease or injury. Moreover, when semi-ownership comprises feeding, but not sterilizing animals, it contributes to the growth of stray populations, because animals that are sufficiently well fed tend to be able to breed (reviewed by Toukhsati et al., 2012).

## **2.3 Study of free-roaming dogs**

Some indications of poor welfare for dogs, including poor body condition, car accidents and the presence of wounds, parasitic and infectious illnesses, such as mange, affect the welfare of free-roaming dogs (Fielding and Mather, 2008; Totton et al., 2011). Moreover, the poor dog welfare is including compromised by the lack of veterinary care (Ruiz-Izaguirre et al., 2014). There are no reliable data indicating their relative population densities or distribution patterns in various

regions throughout the country. However, in a survey conducted by the Bureau of National Statistics and the Bangkok Metropolitan Administration in 1999, it was estimated that approximately 630,000 dogs dwell in Bangkok city (an area of 1 565 sq km). In this survey, approximately 110,000 of the dogs living in Bangkok were considered to be ownerless (stray or feral), whereas the remainder was believed to be owned or were community dogs. Nevertheless, it has not been known how many of the latter group can be accessible or are in compliance with local rabies control regulations. When the dog population statistics collected in 1999 are compared to an earlier survey conducted in 1992, the stray dog population appears to have almost tripled in size in Bangkok over the eight year (Hemachudha, 2005).

Ortolani et al. (2009) reviewed that the term “stray dog” was removed from official vocabulary because it was considered misleading, and WHO recommends using it only for dogs “not in compliance with local regulations”, such as lost, abandoned or free-roaming dogs. The intent of this classification was to help fight the spread of canine transmitted rabies in humans by targeting dogs most at risk of carrying the disease.

Ortolani et al. (2009) studied the behavioral ecological characteristics of free-roaming dogs (*Canis familiaris*) in four Ethiopian villages via observational surveys. The Ethiopian village dogs surveyed in this study have similar characteristics to other free-roaming dog populations in the world: (1) they are almost entirely unrestrained, (2) there is a male-skewed sex ratio in the adult population, (3) the majority appear not to be owned (or at least not declared so) and (4) many of them are found around people’s dwellings.

The researchers also evaluated ‘village dogs’ attitudes towards people using a stranger-approach test. Eighty-five dogs were approached by an unfamiliar Caucasian woman in different contexts and the dogs’ vocal behavior before the approach, reaction to the approach and approaching distance between dogs and observer were systematically recorded. They found variability in village dog behavioral responses to a stranger depending on dogs’ location (inside house, outside house, street), social setting (alone, pair, group) and village. Dogs inside homes and dogs that were alone were more likely to vocalize towards the observer than dogs in the street. Avoiding was the most common reaction exhibited by village dogs, especially when approached in the streets, suggesting that most of them are shy of people. However, 11% responded aggressively towards the observer; all of these dogs vocalized towards the observer before she

approached them. One third of the dogs maintained a neutral attitude apparently ignoring the observer. Slightly less than one third of village dogs could be approached closely (0-2 m), one third could be approached at a medium distance (2-5 m), and over one third could not be approached at all (>5 m).

Altogether, the findings showed that the dog populations in the villages studied were not behaviorally homogeneous, within and between villages. The study suggests that behavioral investigations are useful for characterizing free-roaming/village dogs' attitudes, especially when assessing any risk dogs pose to the human population. The observations suggest that people might have greater chances of being bitten by dogs that: vocalize towards people, are alone or in pairs, and are found inside households. The "approach test" proved to be a simple, effective way of measuring dog attitudes, which could be easily implemented in different parts of the world by training local people. Quantifying behavioral responses of village dogs towards people would be particularly important in areas of the world where potentially fatal dog-transmitted diseases, such as rabies, are still prevalent.

Gácsi et al. (2013) had investigated the novel aspects of dogs' comprehension of human social behaviors by revealing potential differences in the responses of wolves and dogs when they interact with a human in socially ambiguous situations. In Experiment 1, pet dogs (N = 13) and hand-reared wolves (N = 13) encountered a stranger who approached them first in a friendly, then a threatening way, and finally switched back to friendliness again (Approaching stranger; AS) while the passive owner/caregiver was standing close to the subjects. In contrast to dogs, wolves avoided eye contact with both the caregiver and the stranger, however, only dogs showed aggressive displays towards the stranger. In Experiment 2, the same subjects were tested in an Object guarding (OG) situation. A familiar woman, communicating the playful nature of the encounter, pretended to aim at taking away her belt-bag from the subjects trying to make them respond with guarding behavior. Finally, she tried to take away the object without using dominant/threatening behavior. During the Game episode some dogs and wolves showed guarding displays, but only dogs switched their responses twice and finally allowed the human take hold of the object. All dogs but none of the wolves gazed at the owner/caregiver during the test. In Experiment 3, the researchers tested trained Belgian shepherd dogs (N = 13) in AS, OG, and in a Food guarding (FG) situation. In FG a familiar woman challenged the subject to guard a bone by applying enticement but otherwise not communicating the playful/pretended

nature of the encounter. Dogs displayed aggressive behaviors in all three situations as a response to the human's behavior. In AS they adjusted their behavior from passive/friendly to aggressive and then friendly again, according to the switch in the human partner's actions. In OG and FG situations, after showing aggressive guarding displays, they allowed the human to take away the guarded object, both the bag and the food. A characteristic high-pitched vocalization observed during both guarding situations, typically before the first aggressive display, could refer to the dogs' ambivalent emotions. This suggests that the human's challenging behavior alone might be effective to evoke a simulated guarding behavior. The results support the view that dogs have advanced abilities and readiness to combine seemingly contradicting behavior responses to respond to human behaviors or expectations, whilst even hand-reared and extensively socialized wolves tend to display less human centered behaviors and adjust their behaviors less to that of humans' in interspecific situations.

Ruiz-Izaguirre et al. (2014) found that Mexican coastal village dogs were socialized to familiar humans but were not attracted to unfamiliar humans. The objective of this study was to gain an understanding of the village dog-keeping system, and of perceptions of dog-related problems by villagers and tourists, in the coastal region of Oaxaca, Mexico. We conducted a survey of the inhabitants of three villages (Mazunte, Puerto Angel, and Río Seco), whose main economic activities were tourism, fishing, and farming ( $n = 99$ ), and a survey of tourists ( $n = 151$ ). Dogs were the most commonly kept animals in all the villages. Cultural and economic aspects were reflected in dog-keeping practices. All dog owners allowed their dog(s) to roam free in the farming village (Río Seco), but not in the tourist villages (Mazunte and Puerto Angel). Significantly more dog owners in the tourist village of Mazunte mentioned companionship as a reason for keeping dogs than those in the farming village. All villagers perceived as a problem that there were too many dogs. The mean number of dogs per household was 1.8, and there were significantly more male dogs in the farming village than in the tourist villages.

Efforts to control the dog population in the rural coastal region are aimed at rabies prevention or wildlife protection, whereas this study revealed that these issues were far less often mentioned by local people as other dog-related problems. Significantly more villagers in the tourist villages perceived there to be dog-welfare problems than those in the farming village. Significantly more North American and European tourists were concerned about dog welfare than Mexican tourists. Despite significant differences in dog-keeping between the tourist and

farming villages, opinions of villagers in regard to dog breeding and methods of dog population control were similar. Villagers agreed on dog sterilization to control the dog population, but also considered that female dogs should breed at least once in their lifetime. Those living in tourist villages could benefit from improving dog welfare and implementing strategies to lessen the problems dogs cause tourists.

#### 2.4 Conclusion

There are many of Buddhism days in Thailand, even in the public holidays. The Thai or foreign Tourists are interested in visiting temples to experience the Buddhist culture of Thailand. The free-roaming dogs in temples will often meet people who are totally stranger to them or still unfamiliar with. Whether the strangers' approach could influence the behaviors of stray dogs in temples, even made them anxiously, there is rare study on it in Thailand.

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## Chapter 3

### Materials & Methods

#### 3.1 Study sites

The 33 temples in downtown of Nakhon Ratchasima municipality which were found to have more than five dogs from a visual survey (Crump and Scott, 1994) were selected for purposive sampling. The temples in downtown Nakhon Ratchasima municipality which were found to have more than five dogs from a visual survey (Crump and Scott, 1994) were selected for purposive sampling. Then 5 other temples were also chosen at random for study sites from a list of temples. The research procedures used for this study were approved by the Ethics Committees of the authors' institutions. The study was conducted from April to November 2018.

#### 3.2 Dog characteristics

The modified method according to Ortolani et al. (2009): sex, age, body size, body condition, social condition and coat color were recorded. The records of dog characteristics were conducted in April and November in 2018. According to Companion Animal Management (ICAM) Coalition (2018), the physical health indicators (such as body condition score, skin condition score) were evaluated by the researcher. The scoring systems used by a 5-point scoring system (1 = Emaciated; 2 = Thin; 3 = Ideal; 4 = Overweight; 5 = Obese).

#### 3.3 Behavioral observations

A modified method was used according to Ortolani et al. (2009): number of dogs (living alone, in pairs, living with >3 dogs), dogs' behaviors (before approach), the reaction distances of 0-2m, 2-5m and >5 and their reaction behaviors: neural, avoidance, aggressive, vocalization (barking, growling or bark-growling), approach and tail movements: wagging, erect without wagging and tails down (included tucking a tail between the legs; or with a tail hanging low) were observed using the stranger-approach test. All the reaction behaviors were recorded when researcher A approached the dogs and observed their initial reactions. Aggressive dogs were defined as individuals who bared their teeth at researcher A for more than 3s, moved towards researcher A snapping their jaws, and/or attempted to bite him and barking, growling or both. Although some

vocalizations, such as “bark-growling”, might have also been displayed by aggressive dogs, they were not included in the definition of aggressive behavior.

Observations of the dogs' behaviors were made on foot by two researchers with one (researcher B) collecting the behavioral data, while the other (researcher A) approached each dog. When researcher A approached a dog, starting from a distance of 10-15 m, researcher B recorded the dog's reaction time and distance. Approaches were made by walking slowly in a direct line towards each dog avoiding any eye contact and keeping a relaxed and normal straight posture with the arms by the sides. After the 1<sup>st</sup> stranger-approach test, conducted in the 1<sup>st</sup> week, researcher A tried to get the dogs used to him by feeding and grooming them once per week for 3 weeks. The 2<sup>nd</sup> stranger-approach test was conducted in the 4<sup>th</sup> week. Procedure of the experiment was performed with the advice of the Institutional Animal Care and Use Committee, Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima, Thailand.

### 3.4 Statistical analyses

The Chi-Square Test was used when comparing the behavioral data between the 1st week and 4th week of observation. A logistic regression (LR) model was used with behaviors before the approach, number of dogs and tail movements as predictors of the dogs' reaction/non-reaction and vocalization/non-vocalization (i.e. barking, growling or barking-growling). The Hosmer and Lemeshow test was used to check the goodness of fit of the final model. The significance level was 0.05 .

## Chapter 4

### Results

The researchers surveyed the population of dogs from 33 temples in the downtown of Nakhon Ratchasima from April to June 2018. The researchers had seen 198 dogs in 33 temples (Table 4.1). There were 63 female and 62 male dogs. There were 73 dogs unidentified sex because they were under the car or laying down during the survey (see Illustrations 4.1).

**Table 4.1** The number of dogs observed by researchers in temples for the 1<sup>st</sup> time survey

No	Temples	Num of dogs	Sex		
			Female	Male	unidentified
1	Wat Ta Kongkao	3	3	0	0
2	Wat Tong Sewang	8	3	2	3
3	Wat Don Kuang	0	0	0	0
4	Wat Hong	0	0	0	0
5	Wat Sala Tong	10	4	6	0
6	Wat Sala Yen	0	0	0	0
7	Wat Hua Sapan	2	1	1	0
8	Wat Bung	16	9	7	0
9	Wat Nong Pailom	7	3	3	1
10	Wat Pa Salawan	15	9	6	0
11	Wat Mai Amphawan	4	3	1	0
12	Wat Nong Chabok	0	0	0	0
13	Wat Kok Porm	4	1	3	0
14	Wat Kong Phrasai	4	2	2	0
15	Wat Ta Dago	10	0	0	10
16	Wat Susan	11	0	0	11
17	Wat Ban Koh	7	0	0	7
18	Wat Sa Buagren	27	6	17	4
19	Wat Parb	4	2	2	0
20	Wat I San	3	0	3	0

**Table 4.1** The number of dogs observed by researchers in temples for the 1<sup>st</sup> time survey (con't)

No	Temples	Num of dogs	Sex		
			Female	Male	unidentified
21	Wat Pa Narai	13	0	0	13
22	Wat Sa Kaew	7	5	2	0
23	Wat Bueng	3	1	2	0
24	Wat Nong Bualong	0	0	0	0
25	Wat Muwang	3	3	0	0
26	Wat Sakae	0	0	0	0
27	Wat Chaeng Nai	9	0	0	9
28	Wat Po	0	0	0	0
29	Wat Chaeng Nok	8	5	3	0
30	Wat Samo Rai	9	0	0	9
31	Wat Prok	5	3	2	0
32	Wat Pa Yab	2	0	0	2
33	Wat Boon	4	0	0	4
	<b>Total</b>	<b>198</b>	<b>62</b>	<b>62</b>	<b>73</b>

Finally, there were 5 temples were randomly chosen from 14 temples which the number of dogs was more than 5 as the behavioral study sites (see Table 4.2). The total number of dogs from the 5 temples were 43, there were 12 female, 8 male, and 23 dogs unidentified sex during April to June survey. The researchers had seen the total number of dogs was 50 (Female: 26, Male: 13, and unidentified 11) in September behavioral study for the 1<sup>st</sup> meet (see Table 4.3 and Illustrations 4.2).



Illustration 4.1 Dog was under the car or cannot be identified easily (Picture A, B, C, D)

Source : Photo was taken in May 2018 at Temple in Nakhon Ratchasima.

Table 4.2 The 5 temples for behavioral study (survey during April to June 2018)

No	Temples	Num of dogs	Sex		
			Female	Male	unidentified
1	Wat Tong Sewang	8	3	2	3
2	Wat Bung	15	9	6	0
3	Wat Ban Koh	7	0	0	7
4	Wat Sa Buagren	4	0	0	4
5	Wat Chaeng Nai	9	0	0	9
<b>Total</b>		<b>43</b>	<b>12</b>	<b>8</b>	<b>23</b>

**Table 4.3** The number of dogs from 5 temples for Behavioral study (during September 2018)

No	Temples	Num of dogs	Sex		
			Female	Male	unidentified
1	Wat Tong Sewang	9	6	3	0
2	Wat Bung	7	5	2	0
3	Wat Ban Koh	12	5	3	4
4	Wat Sa Buagren	17	9	4	4
5	Wat Chaeng Nai	5	1	1	3
<b>Total</b>		<b>50</b>	<b>26</b>	<b>13</b>	<b>11</b>



Illustrations 4.2 Abandoned puppies were found in the temple

Source : Photo was taken in September 2018 at Temple in Nakhon Ratchasima.



Illustration 4.3 Dogs' coat colors (Picture A, B, C, D)

Source : Photo was taken in May 2018 at Temple in Nakhon Ratchasima.

Most body condition of dogs in 5 temples was ideal. The emaciated, thin, overweight and obese were not found. During the observation, the problem of legs in dogs was not found. The researchers rough estimated the age of dogs (Table 4.2). There were 82.5% and 90.7% of dogs were medium body size (shoulder height was 30-65 cm), others were a small size (shoulder height was <30cm) in the 1<sup>st</sup> and 4<sup>th</sup> week observation, respectively. There were 8 categories coat colors, the most of dogs' (40%) color was Tan, followed by Black, Black and white (Table 4.4 and Illustration 4.3).

**Table 4.4** Age, body size and coat color of temple dogs survey results

Items	1 <sup>st</sup> week		4 <sup>th</sup> week	
	Number of dogs	%	Number of dogs	%
<b>Age</b>				
Pup (<3 month)	1	2.5	2	4.7
Subadult (3-12 month)	4	10	6	13.9
Adult (>1 year)	35	87.5	35	81.4
<b>Body size*</b>				
Small (sh <30 cm)	4	10	4	9.3
Medium (sh 30-65 cm)	33	82.5	39	90.7
Large (sh >65 cm)	0		0	
<b>Coat color</b>				
Tan	17	42.5	17	39.5
Black and white	3	7.5	6	13.9
Tan and white	3	7.5	4	9.3
Black and tan	4	10	3	7
Black, white and tan	2	5	0	0
Black	6	15	8	18.6
White	4	10	3	7
Other	1	2.5	2	4.7
<b>Total number of dogs</b>	<b>40</b>		<b>43</b>	

\*sh=shoulder height

40 dogs were observed during the 1<sup>st</sup> week of observation (visual surveys) and a total of 43 dogs in the 4<sup>th</sup> week observation. The sex of the dogs was not classified, because during each visual survey some of the dogs were under the car and their sex could not be determined (see Illustration 4.1). The social condition of dogs in the 1<sup>st</sup> and 4<sup>th</sup> week of observation was not significantly different ( $P>0.05$ ). The number of single dogs in the 1<sup>st</sup> and 4<sup>th</sup> week of observation was 26 (65%) and 27 (62.8%), respectively. The number of dogs in pairs in the 1<sup>st</sup> and 4<sup>th</sup> weeks was 8 (20%) and 4 (9.3%), respectively (Table 4.5).



**Table 4.5** Social condition and behaviors of dogs investigated before behavioral study

Items	1 <sup>st</sup> week		4 <sup>th</sup> week		Pearson Chi-Square (df)	P- value
	Number of dogs	%	Number of dogs	%		
<b>No. of dogs</b>						
Living alone	26	65	27	62.8	3.248 (2)	0.197
In pair	8	20	4	9.3		
living with >3 dogs	6	15	12	27.9		
<b>Behaviors</b>						
Lying down	20	50	28	65.1	8.903 (5)	0.113
Standing	6	15	3	7		
Walking	12	30	5	11.6		
Running	1	2.5	0	0		
Sleeping	1	2.5	6	14		
Sitting	0	0	1	2.3		

Before the stranger-approach test was conducted in the 1<sup>st</sup> and 4<sup>th</sup> week of observation, 50% or 65.1% of the dogs were lying down; 30% or 11.6% of the dogs were walking; 15% or 7% of the dogs were standing and 2.5% or 14% of dogs were sleeping, respectively. Less frequent types of behaviors were running and sitting (Table 4.4). There were no significant differences ( $P > 0.05$ ) in the dogs' behaviors before the stranger-approach test was conducted in the 1<sup>st</sup> and 4<sup>th</sup> weeks of observation.

The results of the 1<sup>st</sup> week's observation show that 45% of the dogs ignored researcher A (see Illustration 4.4). 25% of the dogs just ran away from researcher A. 12.5% of the dogs showed vocalized behaviors (i.e. barking, growling or bark-growling). Only one dog showed aggressive behavior towards researcher A. 12.5% of the dogs approached researcher A (Table 4.6). There were significant differences in the results between the 1<sup>st</sup> and 4<sup>th</sup> weeks using the Chi-square Test ( $P = 0.05$ ) and the number of dogs whose behaviors were neutral increased by 69.8 % ( $P < 0.05$ ). The number of dogs that ran away from researcher A and vocalized decreased from 11% to 2.3% ( $P < 0.05$ ). The number of dogs which approached researcher A increased in the 4<sup>th</sup> week of observation compared to the 1<sup>st</sup> week of observation ( $P < 0.05$ ). Therefore, the total number of non-reacting dogs in the

4<sup>th</sup> week was significantly more than those in the 1<sup>st</sup> week of observation ( $P < 0.05$ ). There was a significant difference also in the tail movements when the 1<sup>st</sup> week and 4<sup>th</sup> week of observation were compared ( $P < 0.05$ ). The number of dogs showing tail movements such as wagging, erect without wagging and tails down decreased in the 4<sup>th</sup> week of observation (Table 4.6).

The number of dogs which showed no differences in the tail movements increased because the number of dogs showing neutral behaviors increased (Table 5). The number of dogs that reacted significantly decreased in the 4<sup>th</sup> week of observation ( $P < 0.05$ ). The number of dogs that vocalized decreased significantly in the 4<sup>th</sup> week of observation as well ( $P < 0.05$ ).

More than 62.9 % of the dogs started to react to researcher A at distances of more than 5m; and 23.1% of the dogs started to react to researcher A at distances of 0-2 m during the 4<sup>th</sup> week of observation (Table 4.6), however, there was only a marginally significant difference between the 1<sup>st</sup> and 4<sup>th</sup> week of observation ( $P = 0.06$ ).

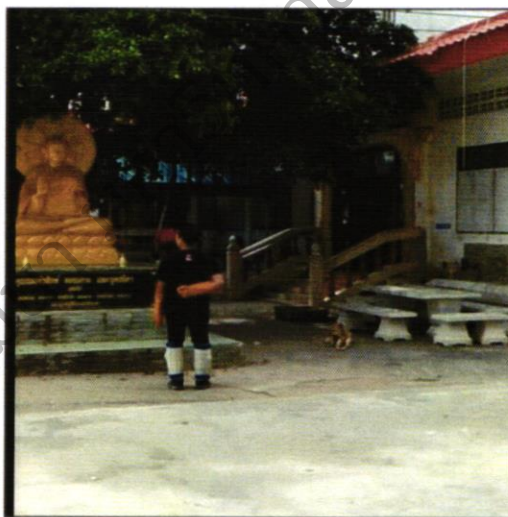


Illustration 4.4 Dog ignored the researcher

Source : Photo was taken in September 2018 at Temple in Nakhon Ratchasima

**Table 4.6** Reactions of dogs in the stranger-approach test.

Items	1 <sup>st</sup> week		4 <sup>th</sup> week		Pearson Chi-Square (df)	P- value
	Number of dogs	%	Number of dogs	%		
<b>Reaction to approach</b>						
Neutral	18	45	30	69.8	9.475 (4)	0.050
Avoidance	10	25	5	11.6		
Aggressive	1	2.5	0	0		
Approach	5	12.5	7	16.3		
Vocalizing*	6	12.5	1	2.3		
<b>Reacting dogs</b>	22	55	13	30.2	5.213	0.022
<b>Non-reacting dogs</b>	18	45	30	69.8	(1)	
<b>Vocalizing</b>	7	17.5	1	2.3	5.479	0.019
<b>Non-vocalizing</b>	33	82.5	42	97.7	(1)	
<b>Tail position</b>						
Wagging	16	40	7	16.3	9.489 (3)	0.023
Erect without wagging	4	10	1	2.3		
Down	5	12.5	7	16.3		
Nothing	15	37.5	28	65.1		
<b>Reaction distance</b>						
0-2 m	0	0	3	23.1	5.629 (2)	0.06
2-5 m	3	13.6	1	7.7		
>5 m	19	86.4	9	69.2		

\*Vocalizing included barking, growling or bark-growling

From the results of a logistic regression analysis of reactions to the stranger approach test, it was found that the number of dogs and tail movements of the dogs were significant predictors of the dogs' reactions or non-reactions ( $P < 0.05$ ). The behaviors of the dogs before the stranger approach test were not a significant predictor of the dogs' reactions or non-reactions ( $P > 0.05$ ) (Table 4.7).

**Table 4.7** The table below shows the results from a logistic regression analysis of reactions to the stranger approach test in terms of dogs' behaviors before approach, number of dogs and tail position (LRT:  $\chi^2 = 63.256$ ,  $df = 3$ ,  $N = 83$ ,  $P = 0.000$ ). The reference category is: reaction/non-reaction.

Predictors	OR	P-value	95.0% CI for OR	
			Lower	Upper
Behaviors before approach	1.529	0.113	0.905	2.584
No. of dogs	0.253	0.036	0.070	0.912
Tail position	0.120	0	0.048	0.301

OR= Odds ratio; CI=Confidence Intervals

From the results of a logistic regression analysis of the reactions to the stranger approach test in terms of the dogs' behaviors before approach, number of dogs and tail movements, it was found that only the tail movements of the dogs was a significant predictor of the dogs' vocalizing or non-vocalizing behaviors ( $P < 0.05$ ). The behaviors performed before the stranger approach test and the number of dogs were not significant predictors of the dogs' vocalizing or non-vocalizing behaviors ( $P > 0.05$ ) (Table 4.8).

**Table 4.8** The table below shows the results from a logistic regression analysis of reactions to the stranger approach test in terms of dogs' behaviors before approach, number of dogs and tail position (LRT:  $\chi^2 = 15.147$ ,  $df = 3$ ,  $N = 83$ ,  $P = 0.002$ ). The reference category is: vocalizing/non-vocalizing.

Predictors	OR	P-value	95.0% CI for OR	
			Lower	Upper
Behaviors before approach	0.462	0.134	0.168	1.268
No. of dogs	0.770	0.604	0.286	2.071
Tail position	0.292	0.003	0.129	0.662

OR= Odds ratio; CI=Confidence Intervals

## Chapter 5

### Discussion and Conclusion

The sex of dogs was not classified in this study, because it was found that some dogs were staying under the car could not be identified the sex during each visual encounter survey and behavioral study. The researchers thought that it was not necessary to disturb them to affect the reality reaction of dogs to human. Moreover, the age of dogs was rough estimated by researchers, because it is impossible to ask exactly information for each individual dog found in each temple. Most of the dogs in temples are medium size in this study.

It was found that there were several dogs groups in each temple. Most of the dogs living in the temples were taken care of by monks or the residents who were volunteers to donate the food for dogs. Some monks said that normally the food from the temple was not enough for all of the dogs living in temples, sometimes they had to pay for dog food by themselves. Songpol (2017) had reported that the temples overwhelmed by abandoned dogs and cats which made them facing a huge problem beyond their control in Thailand. Most of female dogs in temples were spayed/neutered to control the population. However, the number of abandoned puppies is still increased in each temple recently (by personal observation or interview the monks who are caregivers of dogs, such as the three abandoned newborn puppies were found in the temple "Ban Kho" in September 2018).

This study focused on the reactions of dogs when a stranger approached them. Only 17.5% of the dogs vocalized when they met a "stranger" for the first time. After 'the stranger' fed and played with the dogs 3 times, the dogs got used to him. The number of dogs that as vocalized decreased by the 4<sup>th</sup> time of meeting. The authors claim that the dogs are able to remember people after 3 meetings in this study, which is the same as Lomber and Cornwell (2005), who claimed that dogs are able to discriminate between their handler and another person based solely on face recognition. In fact, a deeper study of dogs' cognitive ethology should be conducted in the future.

The behavioral variables correlated with each other and had predictive value over each other: Reaction behaviors predicted reaction distances by 48.6% ( $\lambda=0.486$ ), and the tail movements by 40% ( $\lambda=0.40$ ), and the behaviors before being approached by 28.6% ( $\lambda=0.286$ ). The reaction behaviors did not predict the number of dogs ( $\lambda=0$ ).

Our results found that avoidance was the most common reaction exhibited by stray dogs in temples, which is similar to the results of Ortolani et al., (2009). A common and potentially serious canine behavioral problem confronting pet owners and small animal practitioners is dominance aggression (Taphorn and Draper, 1991), but other causes, such as play, fear, health factors, protective, and re-directed aggression, have been reported as well (Guy et al., 2001). Our findings showed that less than 20% of the dogs immediately responded to researcher A's presence by vocalizing. The function of vocalizing by stray dogs in temples was to warn off intruders (Lord et al., 2009). The authors agree with Ortolani et al., (2009) that the different responses of dogs to people may also reflect their previous experiences.

Ortolani et al. (2009) realized that although avoidance and aggressive behaviors of dogs made it very difficult to approach them, it was found that the dogs that vocalized could be approached if they vocalized a few seconds after they were approached or when the dogs vocalized first and then approached people themselves. However, in our study we recorded the initial reaction of dogs when researcher A approached. It would be useful to add different factors to those used in this study in further studies.

Normally, more than 80% of dogs reacted at a distance of more than 5m from researcher A (stranger). When the dogs were familiar with researcher A, the number of dogs that reacted decreased. Also, the number of dogs showing neutral behaviors increased, possibly due to the fact that the number of their escape routes might have decreased (Grandin and Deesing, 2014). Although the authors of this study have only been concerned with the reactions of dogs to familiar and unfamiliar people, there still needs to be an investigation of the emotional life of dogs and how this relates to the dogs' welfare, emphasizing the crucial role of the tail movements in specific communication (Siniscalchi et al., 2013).

In conclusion, the most body condition of dogs in 5 temples was ideal. The emaciated, thin, overweight and obese were not found. The reaction of dogs is affected by the approach of both familiar and unfamiliar people. The number of dogs and tail movements are related to the number of reacting/non-reacting dogs. Only the tail movements are related to vocalizing or non-vocalizing. This is the first study of reactions of stray dogs to people in temples in Thailand. It will also be necessary to analyze some other emotions (such as fear, playfulness) of stray dogs in temples in reaction to familiar and unfamiliar people. Therefore, further research is needed.

According to Micaela (2018) reported that the temples overwhelmed by abandoned dogs and cats. The number of abandoned puppies is still increased in each temple recently. We need to educate the new generation the knowledge of sterilization, in order to resolve this problem, and teach them to be ready to have a pet, not just to adopt a puppy because it is cute and then leave it at the temple. The vet was careful to frame the issue as “dog population management” rather than “stray population control” to address the root causes of the issue and to better offer pet owners, community members and government the tools and education they need to more humanely address Thailand’s stray animal problem.

สถาบันวิจัยและพัฒนา มหาวิทยาลัยราชภัฏนครราชสีมา

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## Illustrations



Illustrations 1. Observing dog behaviors before test



Illustrations 2. Approaching test at Wat Bung

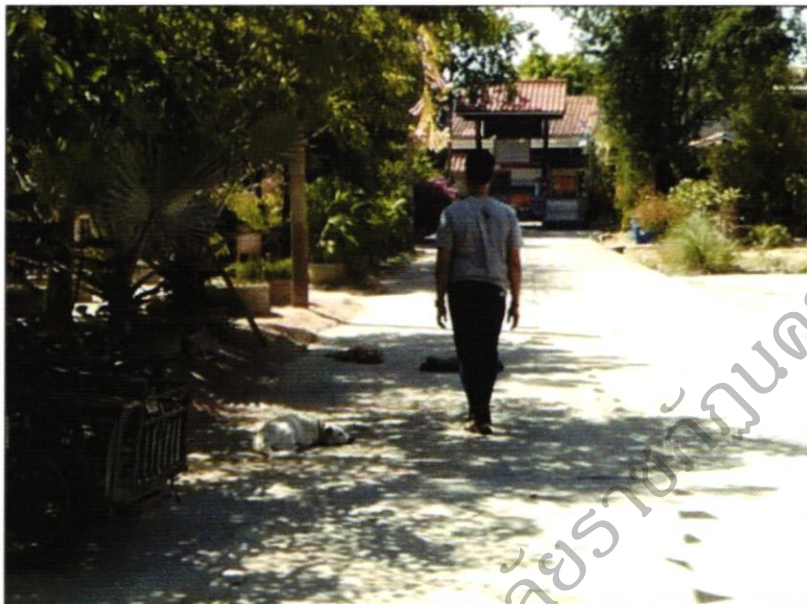


Illustrations 3. Approaching test at Wat Ban Koh

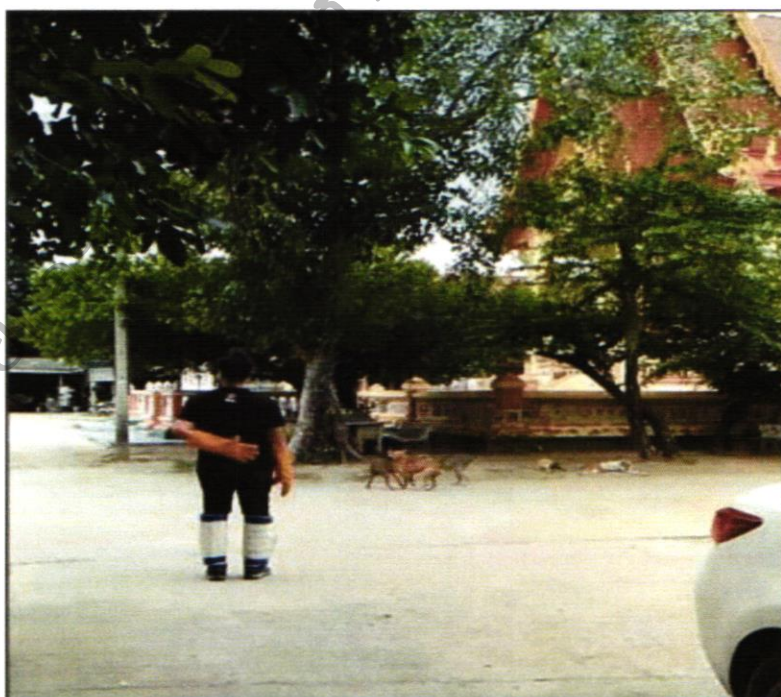


Illustrations 4. Approaching test at Wat Ban Koh

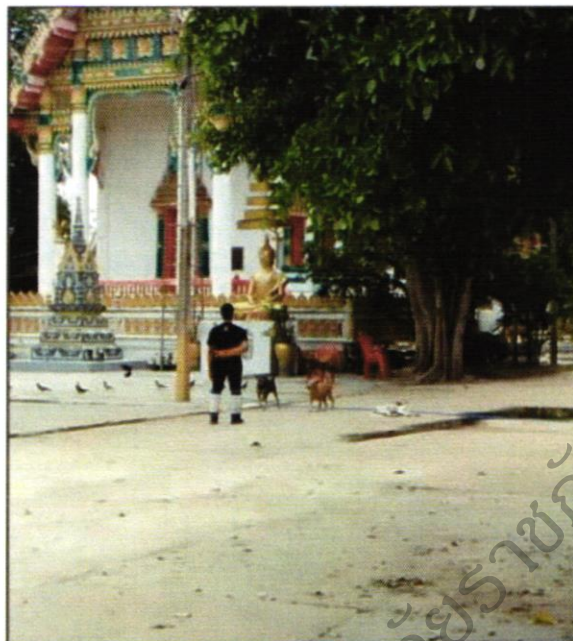




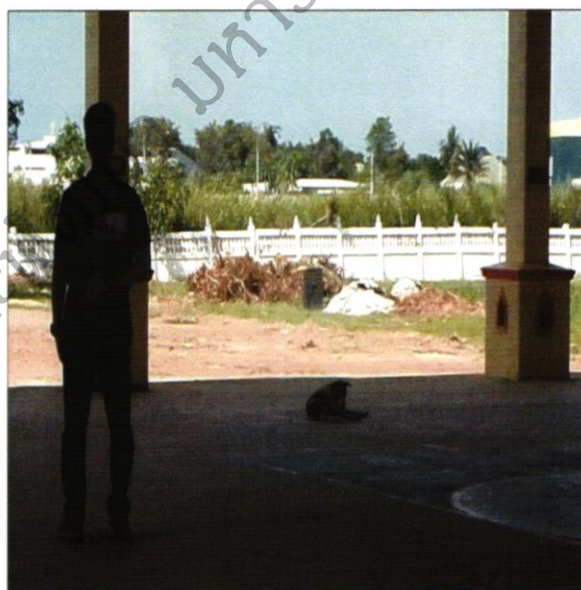
Illustrations 5. Approaching test at Wat Tong Sewang



Illustrations 6. Approaching test at Wat Tong Sewang



Illustrations 7. Approaching test at Wat Sa Buagren



Illustrations 8. Approaching test at Wat Sa Buagren



Illustrations 9. Wat Chaeng Nai



Illustrations 10. Wat Chaeng Nai



Illustrations 11. Feed dogs



Illustrations 12. Feed dogs

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**Xin Huo** and Pongchan Na-Lampang. 2019. Effects of stocking density and age on spatial distribution of Thai crossbred chickens. The 2<sup>nd</sup> International Conference on Native Chicken 2019. pp 115-118. Nakhon Rachasima, Thailand, July 9-12, 2019.

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สถาบันวิจัยและพัฒนา มหาวิทยาลัยราชภัฏนครราชสีมา