

## اشتقاق الأسماء للمخترعات الحديثة

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شهد القرن الحادي والعشرون تطورات سريعة في مجالات مختلفة تحيط بحياة البشر، وأثرت هذه التطورات على لغتهم التي هي وسيلة نقل الحضارة والمفاهيم فيما بينهم. ولما برزت ظاهرة العولمة والخصخصة بميزاتها غابت حدود الدول وانحصرت العالم إلى صورة قرية عالمية، وظهرت التحديات أمام اللغة في سد حاجات العصر الجديد. ومن أهمها حاجات المصطلحات الجديدة لأن تقابل ما توجد في اللغات الأخرى، لأن يسمو بها المخترعات الحديثة والعلوم الحديثة. فتناقصت المتناقصات من لغات العالم في دفاع التحديات الجديدة فانهزمت بعض اللغات أو غلب عليها بعض اللغات الأخرى، لأنها لم تستطع لامتصاص المعاني الجديدة والمفاهيم الجديدة في حصيلتها اللغوية.

والعربية استطاعت أن تقف على رجليها وواجهت التحديات بجرأة وفازت في سبيلها. فلبست الألفاظ القديمة المعاني الجديدة، كما اشتقت الألفاظ الجديدة من صيغ الألفاظ القديمة. وإليه يشير الدكتور أحمد محمد المعروق<sup>١</sup> بقوله: "إن أنماط الحياة وأساليبها في تغير متواصل وتطور مستمر، ووفقا لذلك تتغير حاجات الناس واغراضهم واساليب تعبيرهم وتتطور لغاتهم ولهجاتهم وألفاظهم ومعانيهم، فتشتق كلمات جديدة من اصول قديمة،

<sup>١</sup> وهو أستاذ مشارك للغة والأدب بجامعة الملك فهد للبترول والمعادن بالظهران، حاصل على الدكتوراه في الأدب والنقد من جامعة بنسلفانيا بالولايات المتحدة الأمريكية عام ١٩٨٧م، وله مجموعة من البحوث والدراسات في اللغة والنقد والشعر والرواية والمسرح والبلاغة والأسلوب منشورة في عدد من الدوريات العلمية والمجلات المتخصصة.

وتقتضى ألفاظ غريبة من لغات أخرى مجاورة أو مؤثرة، وتولد صيغ وتراكيب لغوية كما تكن موجودة للتعبير عن مفاهيم ومدلولات مستحدثة، كما قد تستبدل ألفاظ بألفاظ حرة بدافع الرغبة في التغيير أو التجديد، أو بسبب تغير الزمن وتغير الأذواق، وهكذا نرى مراراً المفردات القديمة، وقد تظهر في محيط اجتماعي دون آخر أو تظهر في عصر وتختفي في عصر غيره<sup>١</sup>.

وهو يضيف قائلاً: "إن الألفاظ تابعة للحياة، إنها تتحول بتحولها، فكما أن الحياة تثبت على طور من الأطوار، فكذلك الألفاظ لا تثبت على وجه من الوجوه على ترحي الأحقاب، فالصلة بين الحياة والألفاظ مستحكمة الأواصر، ومثلما تنشأ كلمات وصيغ جديدة للمدلولات القديمة وتضاف إلى مثيلاتها السابقة وتعدد وتتكاثر المترادفات اللفظية. كذلك تنشأ معان ومدلولات جديدة لكلمات قديمة عن طريق التحويل أو النقل أو المجاز أو غيرها ذلك من الأسباب المذكورة أو أسباب وعوامل أخرى غيرها، وهكذا تتعدد معاني الكلمات وتنمو وتتكاثر على مرور الزمن وتوالي السنين"<sup>٢</sup>.

فلما تغيرت العالم رأساً على قدم، استطاعت اللغة العربية أن تنافسها بخير حصيلتها اللغوية مطاوعتها للإشفاق والتوليد والتعريب وغيرها من مناهج عند اللغة العربية. ونشأت المؤسسات اللغوية والمجامع اللغوية وتولى أصحابها هذه المهمة وحققوا جهودهم في هذا السبيل فبقيت اللغة العربية حية وأصيلة.

### تسمية مخترعات الحديثة

وقد شهد العالم منذ النصف الثاني من القرن العشرين ثورات عظيمة مع تغيرات سريعة متلاحقة قلبت الموازين في شتى مجالات الحياة رأساً على عقب، وهذه متمثلة في الثورة العلمية، وثورة الاتصالات، والثورة التكنولوجية، والثورة المعلوماتية وغيرها

<sup>١</sup> أحمد محمد المعتوق، الحصيصة اللغوية، سلسلة عالم المعرفة، المجلس الوطني للثقافة والفنون والآداب

الكويت، ١٩٩٦م، ص: ٥٥ - ٥٦

<sup>٢</sup> نفس المرجع



والاكتشافات الهائلة. فأصبحت اللغات العالمية حائرة أمام السيل الهائل للاصطلاحات الحديثة الجديدة. ولكن اللغة العربية ظلت قائمة على أصولها حية قوية، استطاعت العربية أن تستوعب المخترعات اللغوية الحديثة. والفضل يرجع إلى غزارة الحصيلة اللغوية في لغة العربية ومطاوعة صيغها للإشتقاق والتعريب والنحت وغيرها من المناهج اللغوية، ومساهمة العلماء والمؤسسات اللغوية في العالم العربي مثل المجامع اللغوية.

وإلى جهود هذه المؤسسات اللغوية يشير الدكتور محمد حسن عبد العزيز بقوله وبالإضافة إلى الجهد المشترك للمجامع، وإلى أعمال المنهجية الخاصة بمجالات علمية محددة نجد أعمالا معروفة لا يحجبها الحصر، وأخرى مجهولة، وقد أسهمت هذه الجهود والأعمال بنصيب كبير في اخراج المعجم العربي، بيد أن هذه الأعمال الفردية، والتي كانت غالبا مرتجلة - لها جذورها في حركة التطور المبكرة للترجمة التي بدأت في مصر برعاية محمد علي، وكذلك التطور السريع لطباعة الدوريات الذي تمركز في مصر ولبنان. وقد كان للصحفيين والمترجمين آثارهم المنتجة والمقررة في لغة الحياة، فأخرجوا كلمات جديدة أكثر مما أخرجته المجامع. وباستمرار النمو الصحيح للعربية الحديثة سيأتي مستقبل باهر للغة العربية، وقد تكون المجامع فيه قادرة على النهوض بدور طبيعي معياري فحسب، نور الحفاظ على نقاء اللغة التي لن تكون من صنعهم بالمعنى الضيق. انه من الانصاف أن نلاحظ معظم جهود الفردية تستند - هي الأخرى إلى الأساس اللغوي الصحيح للإشتقاق بقياس<sup>١</sup>.

فوضع هؤلاء العلماء والمؤسسات مبادئ ومعايير وقوالب منظمة للصيغ الجديدة، فكر كلمات جديدة يجب أن تخضع لهذا المعيار، وقد حاول مجمع اللغة العربية بالقاهرة أن يحدد القوالب الاسمية ليدر احتمالات استخداماتها القياسية للكلمات الجديدة. وقدموا مقترحات قيمة في اشتقاق الأسماء باستعمال الأوزان العربية المعروفة، ومنها:

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"صيغة (فَعَالَة) بكسر الفاء للدلالة على الحرفة أو نوع النشاط مثل: صناعة، وطباعة، وسفارة وجراحة وصحافة.

وصيغة (فَعْلَان) بفتح الفاء والعين لفعل اللازم للدلالة على تقلب أو اضطراب مثل موجات للدلالة على تتالي الموجات الكهربائية في الأثير وسيلان، وطيران وغيرها..

وصيغة (فَعَال) بضم الفاء للدلالة على المرض مثل سعال، وزكام، وجذام.

وصيغة (فَعَّال) بفتح الفاء لاشتقاق كلمات تدل على الحرفة أو ملازمة الشيء مثل: جراح وطيار، وسواق.

وصيغ اسم المكان (مَفْعَل) بفتح العين و(مَفْعِل) بكسر العين و(مَفْعَلَة) بفتح العين، وعلى هذه الصيغة وردت كلمات جديدة كثيرة مشتقة بالمعنى الكامل كما جاءت بعضها توسعت دلالية، ومنها: (مصنع)، و(مجمع)، و(مأسات)، و(موقف)، و(مطار)، و(محطة).

وصيغ (مَفْعَل)، و(مَفْعَلَة)، و(مِفْعَال) و(فِعَال) مثل "تقاب" في اسم الآلة، ولكن لما أحسوا أن التصنيع الحديث قد تتطلب مزيداً من صيغ اسم الآلة، اقترحوا لذلك أن يضاف إلى صيغ الثلاثة المشهورة في اسم الآلة، صيغة (فَعَالَة) مثل "ثلاجة" و(فَاعِلَة) مثل "ساقية" و(فَاعُونَة) مثل "ساطور". فأصبحت الصيغ القياسية في اسم الآلة سبع صيغ.<sup>1</sup>

صيغة (فَعَالَة) بفتح الفاء وتضعيف العين التي تدل على آلة أو أداة أو مكان يظهر فيه شيء فقد استخدمت استخداماً موسعاً في الاشتقاق الحديث، والوظيفة الأساسية لوصف المبتدع لصيغة المذكر من هذا الوزن (فَعَال) بفتح الفاء وتضعيف العين تعبر عن مدلول ثابت مألوف للحديث. مثلاً: سيارة، دبابة، حراقة، ونفاثة.

صيغ الآلة هي من أكثر الأوزان العربية استخداماً في عصر انفجار العلوم والمعلومات حيث تخترع في كل يوم آلات مختلفة، تقتضي أسماء تلائمها وتوضح دلالتها ومفاهيمها.

<sup>1</sup> الدكتور شوقي ضيف، مجمع اللغة العربية في خمسين عاماً ١٩٣٤ - ١٩٨٤م، مجمع اللغة العربية جمهورية مصر العربية، الطبعة الأولى، ١٩٨٤م، ص: ١١٢.

وقد انعقد أجماع علماء اللغة فيما يتصل بمعالجة الكلمات الجديدة على أن صوغ معجم جديد ينبغي أن يسير العمل فيه وفقا لثلاثة مبادئ<sup>١</sup>. فالأول هو: الاشتقاق من جذور موجودة، والثاني: الاشتقاق بالحاق مدلول جديد بمدلول قديم اما من خلال توسع استعاري دلالي (الوضع المجازي) أو من خلال احياء المفردات الغريبة. (غريبة اللغة) حيث يضاف اليها دلالات معاصرة - وان لم تكن لها علاقة مباشرة بها. والثالث: صياغة مفردات جديدة بوساطة ما يعرف بالاشتقاق المعنوي أو الاشتقاق بالترجمة، حيث يكمن في ترجمة المصطلحات الأجنبية أي في صيغ وصفية مرادفة مفسرة.

### الاشتقاق من جذور موجودة

في رأي سننكيفتش (Sntenkevich) ليس هذا المبدأ واضحا - كما هو مفترض - اذ ربما يدخل كثير من المفردات الجديدة التي ينطبق عليها شكليا في مجال المفردات التي ينطبق عليها المبدأ الثاني. أي بين المفردات التي اتسع مدلولها بالمعنى العام، وبخاصة عندما يكون المتوسع بالتجريد وبالتعميم، أو حين تكون المفردات هي الأصل للتوسيع الدلالي المجازي، ومن ثم قد تنتهي الحالة الأخيرة إلى استخدام اعتسافي ملزم للكلمات القديمة لأغراض جديدة<sup>٢</sup>.

يقدم سننكيفتش مناقشة حول هذا النوع من الاشتقاق يقول فيها: "وثمة تطور تاريخي يمكن ملاحظته فيما يتصل بالكلمتين الجديدتين (مجهر) و (مجهار) فالجذر (جهر) الشيء ما يرى وما يسمع سواء : ظهر وتمكن مشترك في الكلمتين كليهما. والمجهر بمعنى (microscope) يمثل اشتقاقا مقيسا من الجذر المعنوي. والكلمة مجهار بمعنى (Loudspeaker) هي طراز مباشر لتوسيع مجازي للمعنى القديم: الذي يتكلم بصوت حاد

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وواضح ، شخص يتكلم إلى الجمهور . والكلمة مجهار في ذاتها اسم آلة بمعنى تاريخي فيجب فحسب، وبمعنى مباشر هي صيغة مبالغة تشير بدقة إلى المعنى الحديث لـ (Loudspeaker) فانتقل المعنى من الشخص إلى الآلة توسعا. ولهذا احتفظت بمعنى المبالغة مع أنها أصبحت في نمطها القديم اسم آلة شكلا. وأما الكلمة الحديثة (مصعد) فتعد اشتقاقا صغيرا لجذرها الفعلي (ص ع د) مع وجود كلمة أخرى لصيقة بها اشتقت قديما وهي مصعاد - آلة أو طوق لتسلق النخيل. والمعنى الأصلي لـ (مروحة) هو أداة يجب بها نسيم الهواء في الحر وهو توسع مجازي حديث<sup>١</sup>.

وفي صيغ اسم المكان يحلل صاحب "العربية الفصحى الحديثة" بعض الأمثلة:

(مصنع) - (factory) ربما تعد توسعا

(مجمع) (academy) توسع دلالي، أصله مكان الاجتماع

(مأساة) (tragedy) اشتقاق سليم حديث من جذر فعلي

(موقف) (stop, station) توسع دلالي

(مطار) (airport) توسع دلالي والمعنى القديم هو موضع تطير منه أو ليه الطيور.

(محطة) (station) توسع دلالي المعنى القديم مكان يوضع فيه شيء أو مكان يستقر فيه<sup>٢</sup>.

ومن الأمثلة لصيغة (فعالة) التي تدل على آلة أو أداة أو مكان يظهر فيه شيء:

(دبابة) (tank) توسع دلالي، لآلة الحرب المستخدمة في العصر الحديث  
(testudo)

<sup>١</sup> سننكيفتش، العربية الفصحى الحديثة ، ص: ٤٥ - ٤٦

<sup>٢</sup> سننكيفتش، العربية الفصحى الحديثة ، ص: ٤٧ - ٤٨

(حراقة) (torpedo) توسع دلالي للكلمة الوسيطة (fire ship)

(برادة) (refrigerator)

(ثلاجة) (freezer)

(دباسة) (stapler)

والصيغ الاسمية والوصفية تستخدم في توليد مفردات جديدة، وهناك صيغ تجيء على أوزانها كلمات جديدة مرتجلة، ومن أمثلتها:

"(شطيرة) (sandwich) نشأت هذه الكلمة في مجمع القاهرة من الجذر (شطر) مستخدما في نمط محكم متسق ليصف شكل (سندوتش)

(عميل) (client, agent) ومن الملحوظ أن لهذه الكلمة معنى غير المحبب وهو (evil deed)

(رتيب) (monotonous) وهذا المعنى الحديث يمكن بالفعل أن تكون له علاقة بالمعنى القديم، مثلا: أمر رتيب أي متصل غير منقطع".<sup>١</sup>

وقد جاءت كلمات جديدة بغزارة من صيغ اسم الفاعل والمفعول من الأفعال العربية، ومنها ما جاء في وزن (فعل) بفتح الفاء وتضعيف العين المفتوحة. ومن الأمثلة في هذا النوع:

محرك (engine)

مولد (generator)

مدرج (auditorium)

ومن الأمثلة:

مستوى (level, standard) وهذا الاسم مشتق من المعنى القديم لفتح  
(استوى) أصبح مستويا أو مساويا لشيء.

مجتمع (society) وقد لوحظ المعنى القديم (مكان الاجتماع) عند تسجيل  
المفردات الحديثة.

وتتخذ الكلمات الجديدة في صورة من صيغ المصدر أيضا توسعا دلاليا، ومنها:

ارتسامات (impressions)

تبلد (acclimatization)

تصلب (intolerance)

يقول سنتكيفتش أن هناك طريقة أخرى في خلق الكلمات الجديدة هي اشتقاق صفات وأسماء  
معان بواسطة ياء النسبة وأمثلة هذا النوع كثيرة ومألوفة<sup>٢</sup>، ومن الأمثلة:

شيوعية (communism)

اشتراكية (socialism)

مسرحية (theatrical)

العشرينيات (the twenties)

اسبقية (precedence)

<sup>1</sup> سنتكيفتش، العربية الفصحى الحديثة، ص: ٥٤ - ٥٥

<sup>2</sup> سنتكيفتش، العربية الفصحى الحديثة، ص: ٥٦ - ٥٧

- افضلية (preference)
- عضوي (organic)
- هروبي (escapist)

### الاشتقاق بالحاق مدلول جديد بمدلول قديم

هذه المجموعة كما ناقشنا في مطلع الفصل، تتألف من مفردات تبدو في صورة توسعات مجازية (الوضع المجازي) أو في صورة احياء المفردات غريبة لها اتصال ضعيف بالمعاني الحديثة (غريب اللغة).

يقول صاحب "العربية الفصحى الحديثة": "إن المنهج المجازي للإشتقاق يكشف عن فعاليات التطور التاريخي للكلمة العربية (Arabic etymology) بعيدا عن الاشتقاق الجذري الشكلي (formal root derivation) انه في الحقيقة ليس منهجا حديثا، لأن كثيرا من مصطلحات علم الكلام العربي، القديم والفلسفة والعلوم مدينة بوجودها إلى هذا المنهج. والاسهامات الحديثة لا تخرج عن العريف ولاستخدام القياسي المنتظم".<sup>١</sup>

يبين سنتكيفتش موقف مجمع اللغة العربية في هذا المنهج بقوله: " وقد جعل مجمع اللغة العربية بالقاهرة حين عني بتحديد الصور المتنوعة للكلمة المشتقة - جعل التوسع المجازي طريقا مفيدا لتزويجنا بمعجم جديد للإستعمال العام أو للإستعمال العلمي، وبخاصة في حالات يصعب فيها استخدام الاشتقاق الجذري الشكلي، أو في حالات يبحث فيها مفردات من اللهجات المحلية أو من اللغات الأعجمية. وينبغي وفقا لرأي قيل في داخل المجمع، أن توضع كلمة من غريب اللغة لتعبر عن مدلول الكلمة العامية أو الأعجمية لأن انتحاء هذا النحو يقلل من وضع كلمات جديدة في المعجم العربي، ولن يتضرر المعجم العربي اذا ما شتقت الكلمات الجديدة من الغريب فحسب، وكل ما سيحدث أن معاني المفردات سوف تتغير، وقد فضل أصحاب هذا الرأي استخدام الغريب على أن تضاف معان جديدة إلى

سنتكيفتش، العربية الفصحى الحديثة، ص: ٦٠

الكلمة القديمة والتي لا تزال تستخدم حتى اليوم لأن هذا سوف يؤدي إلى تفاقم مشكلات دلالية خطيرة خاصة بالاشتراك. شرط آخر وضعه المجمعون هو أن يكون بين المعاني الجديدة ومعاني الجذور الأصلية للكلمات المصاغة قديما مناسبة ونادرا ما راعي مقترح الألفاظ الجديدة أنفسهم معاني الجذر، ومع ذلك فقد ساد مفهوم أوسع للتناسب المجازي بين المعاني القديمة والجديدة. ومن الطريف أن آراء أعضاء المجمع من الغربيين كانت أكثر تحفظا وحذرا فيما يتصل باستخدام الكلمات القديمة المهجورة لمعاني حديثة. فعندهم أن احياء هذه الكلمات القديمة يعني بالضرورة افقار اللغة العربية في وظيفتها الأدبية<sup>١</sup>.

ومن الأمثلة:

- قطار (train) لقيت هذه الكلمة قبولا سريعا ومبكرا، وهي لغويا من أكمل المثلة على عملية تطور الكلمات على مستويات مختلفة. معناها القديم (عدد من الابل يشد بعضه إلى بعض على نسق) وهي تزودنا بالتمائل المرئي بين قافلة من الجمال وصف من العرباب، يجعلها ترجمة للمصطلح (train) في ترجماتها الأوربية العديدة. وثمة اشتقاق آخر من الجذر (قطر) يزودنا بالكلمة قاطرة (locomotive)<sup>٢</sup>.
- بيئة (environment) ، استعمالها القديم كان المنزل الذي يرجع إليه.
- جريدة (journal)
- أدب (literature)
- مجلة (magazine)
- خلية (cell) وهي مأخوذة من المعنى القديم (خلية النحل) أي بيتها الذي تسعل فيه.
- اضبارة (file) معناها القديم (حزمة من الورق أو الكتب)

<sup>١</sup> سنتكيفتش، العربية الفصحى الحديثة ، ص: ٦٣

<sup>٢</sup> سنتكيفتش، العربية الفصحى الحديثة ، ص: ٦١



- صومعة (silo) معناها القديم (منارة الراهب) ولكن لها علاقة تاريخية بالكلمة (صمعة بفتح الصاد وسكون الميم وهي خزانة لحفظ القمح).<sup>١</sup>

وقد ناقش أديب مروه كيف تطورت كلمة جريدة من معناها القديم وأصبحت شائعة في معناها الجديد، فيقول: " ان أحمد قارس الشدياق صاحب جريدة الجوائب ومناظر الدحداح في المسائل اللغوية استعمل لفظة (جريدة) وهي مأخوذة عن الجرائد أي قضبان النخل المجردة من خوصها. وقد جرت العادة عند العرب بعد الاسلام أن تكتب بعض العبارات والآيات القرآنية على قضبان النخل عند دفن الميت. وتوضع هذه الجرائد المكتوبة في قبره، وما تزال هذه العادة سارية عند المسلمين إلى يومنا هذا. ومن هنا كانت التسمية مجازية بمعنى ان الجريدة هي ما يكتب عليها".<sup>٢</sup>

#### الاشتقاق المعنوي أو الاشتقاق بالترجمة

وهي كلمات جديدة مشتقة بطريقة الترجمة أو إعادة المفردات الأجنبية صياغة وصفية. والمفردات والمصطلحات الجديدة التي نتجت بهذه الطريقة جاءت كثيرة في العصر المعاصر، نتيجة للتأثر الانجليزية على الجيل الناشئ من العرب، رغم محاولات مستمرة من قبل المؤسسات والمجامع اللغوية لتوليد الكلمات من أصول عربية. وهذا النوع من المصطلحات الجديدة تكثر في توليد المقابلات العربية للتركيبة الانجليزية مثل أسماء اللجان والمؤسسات والإجراءات العلمية وغيرها.

والفضل في هذا النوع من الاشتقاق يرجع إلى حركة الترجمة التي حدثت في القرن لتاسع عشر وتطور الصحافة العربية التي لا تزال حية في العالم العربي، حيث أنها واجهت عربية بطوفان من المفردات أو العبارات التي صيغت على عجل، وكانت هذه العبارات لمركبة الجديدة كانت محصلة ترجمات خالصة.

<sup>١</sup> سننكيفتش، العربية الفصحى الحديثة ، ص: ٦٦

<sup>٢</sup> أديب مروه، الصحافة العربية نشأتها وتطورها، منشورات دار مكتبة الحياة، بيروت، الطبقة الاولى،

ومن الأمثلة الواردة في هذا المنهج<sup>١</sup>:

- مجلس شورى القوانين (legislative council)
- الجمعية العمومية (General Assembly)
- مركز الثقل (centre of gravity)
- مركز الشرطة (police station)
- تكييف الهواء (air conditioning)
- الانعكاس الشرطي (conditional reflex)
- التنفس الصناعي (artificial breathing)
- العميات الأفقية الرأسية (crossword puzzle)

ومن المصطلحات الصحافية في هذا السبيل<sup>٢</sup>:

- "محادثات السلام (Peace talks)
- قمة دول عدم الانحياز (Non aligned summit)
- مكافحة الإرهاب (Fight against terrorism)
- مجموعة عمل (Working group)
- أحزاب المعارضة (Opposition parties)

<sup>١</sup> سنتكيفتش، العربية الفصحى الحديثة، ص: ٦٨ - ٦٩

<sup>٢</sup> الدكتور حبيب الله خان، دروس في الترجمة الصحفية، دار السلطان للطباعة والنشر، نيو دلهي

٢٠٠٨م.

- التعاون الاقتصادي (Economic cooperation)
- الأمريكي بنغلاديشي الأصل (Bengladeshi origin American)
- رجل أعمال (Business man)
- وكالة الأنباء (News agency)
- اتفاق معقول (Reasonable agreement)
- مشكلة الحدود (Boarder problem)
- العلاقات الثنائية (Bilateral Relation)
- حكومة ائتلافية (Coalition government)
- حرية التعبير (Freedom of expression)
- الطاقة النووية (Nuclear energy)
- المجتمع الدولي (International Community)
- هجوم انتحاري (Suicide attack)
- مؤتمر صحفي (Press conference)
- نظيره المصري (His Egyptian counterpart)
- متعددة الثقافة (Multicultural)
- متعددة الأعراق (Multiethnic).

المصطلحات المركبة في العصر المعاصر أيضا تخضع لهذا المنهج، وخاصة في المصطلحات الإقليمية. ومنها ما وردت من بلاد غير الناطقين باللغة العربية مثل الهند، حيث علماء العربية في تلك البلاد ترجموا معاني تراكيبيها إلى العربية وأصبح شائعا في بلدتهم حتى دخلت في المعاجم التي نشرت في تلك البلاد.

ومن الأمثلة<sup>١</sup>:

- "هيئة المطارات الهندية (airport authority of India)
- نائب مفوض البوليس (Assistant commissioner of Police)
- الجمعية الأمريكية لطب الأسنان (American Dental Association)
- بنك التنمية الآسيوية (Asian Development Bank)
- جمعية اللهجات الأمريكية (American Dialect Society)
- الاتحاد الإفريقي لكرة القدم (African Football Confederation)
- اتحاد البريد الإفريقي (African Postal Union)
- جمعية الصناعات لعموم الهند (All India Association of Industries)
- قسم تربية الحيوانات (Animal Husbandry Department)
- اتحاد جمعيات الشطرنج لعموم الهند (all India Chess federation)
- جمعيات الجامعات لعموم الهند (All India Federation of Universities)

<sup>١</sup> سيد إحسان الرحمان، قاموس الاختصارات (إنجليزي عربي)، وايس بابليكاشان، جامعة ناكار،

دلهي، ٢٠٠٥م.

- قوات أمن الحدود (Boarder Security Force)
- معهد التوحيد القياسي البريطاني (British standards Institution)
- دائرة المعايير الهندية (Bureau of Indian Standards)
- لجنة تنسيق عمل المسجد البابري (Babri Masjid Action coordination Committee)
- المحاسب القانوني (Chartered Accountant)
- الحملة ضد قتل الأجنة الاناث (Campaign against Female Foeticide)
- الحملة ضد عمالة الطفولة (Campaign against Child Labor)
- وحدة الجرائم ضد المرأة (Crime against Women Cell)
- شركة إذاعة كولومبيا (Colombia Broadcasting System)
- مكتب التحقيقات المركزي (Central Bureau of Investigation)
- الارهاب عبر الحدود (Cross Boarder Terrorism)
- تلفزيون الدائرة المقفلة (Closed Circuit Television)
- الدفاع المدني (Civil Defence)
- معهد البحوث الدوائية المركزي (Central Drug Research Institute)
- معهد البحث الطاقى المركزي (Central Power Research Institute)
- متوسط نقاط الدرجات المجمعية (Cumulated Grade Point Average)

- هيئة المياه التابعة للحكومة المركزية (Central Government Water Board)
- المعهد المركزي للغة الانجليزية واللغات الأجنبية (Central Institute of English and Foreign Languages)
- قاضي أول للقضايا العدلية (Chief Judicial Magistrate)
- مجموعة التحكم في الأزمة (Crisis Management Group)
- لجنة البحوث الفضائية (Committee on Space Research)
- لجنة اعادة النظر في الدستور (Constitution Review Committee)
- لجنة تعويض المستهلكين (Consumer Redressal Committee)
- قوات شرطة السكة الحديد المركزية (Central Railway Police)
- قوات الشرطة الاحتياطية المركزية (Central Reserve Police)
- مركز البحوث الصناعية والعلمية (Central Scientific and Industrial Research)
- قانون ضريبة المبيعات المركزي (Central Sale Tax Act).

وقد ذاعت هذه المصطلحات المركبة التي جاءت بطريقة الترجمة أو بالاشتقاق المعنوي في لغة العلوم والتكنولوجيا خاصة ذبوعا بالغا، وهناك أمثلة غزيرة في المجالات والدوريات والمنشورات العربية في العصر الحديث الحديثة.

وخلاصة القول: أنه قد احصى ما يمكن اشتقاقه من الأفعال اربع عشرة صيغة اسمية هي (المصدر، المصدر الميمي، اسم المرة، اسم الهيئة، اسم الفاعل، اسم المفعول).

الصفة المشبهة، اسم التفضيل، اسم الزمان واسم المكان، اسم الآلة على مفعول، اسم الآلة على مفعول، اسم الآلة على مفعلة ثم اسم المهنة على فعالة بكسر الفاء، ثم الوصفية على فعيل وفعول).

ملخص القول:

شهد العصر الحديث تطورات سريعة في شتى مجالات الحياة بما فيها العلوم والتكنولوجيا والمعلومات وغيرها، واقتضى هذه التطورات والثورة المعلوماتية توسعا في حصيلة اللغات العالمية بما فيها اللغة العربية حيث اقتضت المخترعات الحديثة التابعة لهذه التطورات أسماء يسمي بها تلك المخترعات والآلات كما اقتضت مصطلحات لتبين مناهج تشغيلها في كتيبات المنتجات الحديثة.

ولما ظهرت العولمة والخصخصة على المستوى الدولي قصرت المسافة بين الدول في العالم كما غابت الحدود بين الدول وأصبح العالم قرية دولية متحررة من قيود المعقد في المعاملات الدولية والصفقات التجارية. فاختلط العرب بالعجم بكثرة فاقترضوا الألفاظ والمصطلحات فيما بينهم وتأثرت اللغات من اللغات الأخرى، ولما كانت القيادة في عصر العولمة في أيد الدول الغربية سادت وأثرت لغتهم على اللغات الأخرى.

تأثرت اللغة العربية من اللغة الانجليزية، حيث أصبحت اللغة الانجليزية همزة الوصل بين دول العالم. فاستوردت العربية المصطلحات الجديدة باستخدام المناهج اللغوية التقليدية والحديثة مثل الاشتقاق وتوسع الدلالات والنحت والتعريب وغيرها. تأسست المؤسسات اللغوية والمجامع اللغوية في العالم العربي فهذه قامت بجهود قيمة في سبيل استيراد الألفاظ والمصطلحات الجديدة.

فلما أحس علماء اللغة العربية الحاجة الماسة إلى المصطلحات الجديدة فتشوا ويبحثوا ما يقابلها في خزانة حصيلة اللغة العربية الأصيلة فاذا وجدوا مقابلاتها استخدموها إذا لم يجدوا ما يقابلها في تقليد اللغة العربية وضعوا لها مصطلحات أو ألفاظا جديدة بطريقة الاشتقاق والمجاز من الكلمات العربية الأصيلة ولكن في بعض الأحيان عجزوا في استيعاب

المصطلح الغربي الجديد في اللغة العربية فعربوا الكلمات الانجليزية مع مراعاتهم على حروف الأوزان العربية. وكان بين علماء اللغة من بذلوا جهودهم في تحديث اللغة العربية كما كان منهم من قاموا وادعوا بتأصيل اللغة أو ترجمة الصطلحات للمحافظة على أصالة اللغة العربية كما كان أيضاً بينهم من وسعوا نطاق استيعاب المفردات الجديدة بطريقة التعريب وذلك شغفا لإحياء اللغة العربية وجعلها لغة العلوم وتكنولوجية المعلومات في العصر الحديث.

المصطلحات الجديدة العربية التي تشتق في العصر الحديث تنقسم إلى أقسام: ومنها التعابير الاصطلاحية، وأسماء المخترعات الحديثة، ومصطلحات العلوم المختلفة، والمصطلحات المنحوتة من التراكيب، وغيرها.

والتعابير الاصطلاحية الجديدة في العربية أغلبها متأثرة من التعابير الانجليزية أسلوباً وتركيباً، ولها علاقة وثيقة بالثقافة وتقاليد المجتمع. وهناك مناهج ثلاثة لترجمة التعابير الانجليزية إلى العربية، وذلك العثور على المقابلة الصحيحة في اللغة العربية لفظاً ومعنى للتعابير الانجليزية، والثاني: استيراد شبه المقابلة بطريقة الترجمة، والثالث إعادة الصياغة في اللغة العربية مرة جديدة لمفهوم التعابير في الانجليزية.

وفي الاشتقاق نهج علماء اللغات مناهج ثلاثة: وذلك باشتقاق الألفاظ من الجذور المتواجدة بتحويل الكلمات العربية إلى أوزان الصيغ الأخرى من صور الألفاظ العربية مثل صوغ اسم الفاعل والمفعول من الكلمة. والثاني هو الحاق مدلول جديد بمدلول قديم بالمجتر والاستعارة. والثالث هو الاشتقاق المعنوي أو الإشتقاق بالترجمة.

تسمية المخترعات الحديثة هي من التحديات التي واجهها اللغات العالمية في العصر الحديث حيث وجدنا مكتشفات عديدة ومخترعات كثيرة في مجالات لا حصر لها، فأحى علماء اللغة العربية الألفاظ والمصطلحات المهجورة في اللغة العربية وأعطوها دلالات جديدة ووضعوها لمصطلحات جديدة، وأحياناً اقترضوا بعض الكلمات الإنجليزية واللاتينية لتسمية الآلات الجديدة والتعبير بمصطلحاتها الحديثة. وبالنسبة إلى العربية هناك أوزان مختصة تصاغ بها، ومنها صيغ أسماء الآلة، وأسماء الأصوات، وأسماء الأمراض، وأسماء



المكان والزمان، واسماء الفاعل والمفعول، والمصدر، والمصدر الميمي، واسم المصدر، والمصدر الصناعي، وصيغة المبالغة وغيرها من تقليد اللغة العربية. فاستخدموا تلك الأوزان بالقياس والسماع من العرب. والفضل يرجع إلى علماء اللغة الذين وضعوا الأوزان للألفاظ العربية وحصيلة اللغة العربية الغزيرة. فبقيت لغة الضاد حية نشيطة عندما قام أصحاب اللغات الأخرى حائرين أمام السيل العظيم من المفردات الجديدة من مجالات العلوم وتكنولوجية المعلومات في العصر الحديث.

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# The significance of shola forests as regions of endemism, in the context of Western Ghats being a 'Hottest hotspot of Biodiversity'

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## ABSTRACT

A detailed floristic expedition was carried out for more about a decade in various Tropical Montane (Shola) forest regions of Kerala State, South India, for analyzing the plant diversity, endemism and the conservational importance. The study areas comprised major shola forest regions of Idukki High ranges in Kerala such as Mannavan Shola (the largest shola forest of the state), Pambadam Shola, Pullaradi Shola, Idivara Shola, Sholas of Eravikulam National Park, Vellari Mala Shola of Wayand etc. A total of 669 angiosperm and 93 pteridophyte taxa were collected from the study areas, which certainly indicates the high diversity prevailing in these regions. The collection of pteridophytes, which comprises 27.6 % of the total pteridophyte flora of the state (337 species). Among the 669 angiosperm taxa collected, 246 (36.8%) belong to endemics. More than 30 % of the plants are endemic to Western Ghat regions only and about 6 % are endemic to South India. These figures substantiates the general view that sholas as megacentres of endemism.

About seven plants, which were considered as 'possibly extinct', could also be rediscovered. This include *Actinodaphne bourneae* Gamble, *Arisaema attenuatum* Barnes & C.E.C. Fisch., *Arisaema psittacus* Barnes, *Impatiens anaimudica* C.E.C. Fisch., *Impatiens platyadena* C.E.C. Fisch., *Pimpinella pulneyensis* Gamble and *Symplocos monantha* Wight. About 70 plants, including 15 pteridophytes could also be located for the first time from Kerala. Thorough explorations in the area may lead to the discovery of more new taxa, since many of the regions remain still unexplored due to inaccessibility and hostile environments. All this points out the need for conservation of sholas, which face several threats of destruction.

In short, the sholas which are floristically unique in all respects, have to be protected and explored thoroughly to elucidate the floral diversity and status of the endemics, before they get extinct due to degradation, depletion or conversion of natural vegetation.

# **The power of machines in automatic detection of diseases: a review on computer aided detection of breast cancer in digital mammograms**

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## **1.INTRODUCTION**

Healthystate is the power of human immunityand keeping of the healthy state is a challenging thing. Human body has the power to regain its healthy state when there is a disease. This retaining of healthy state is faster with right medicine with right usage and dose. So, for early diagnosis, early detection is also needed. That is, one of the main challenges in medical field is the early detection or identification of the diseases. Nowadays machines are playing a vital role in early detection of diseases and most of the doctors and medical expertsare utilizing these advantages. So we can say that the doctors, medicines and the machines are playing vital roles in the early detection and diagnosis of diseases in human bodies.

Cancer is one of the deadliest diseases in the world. Cancer disease is a state in which abnormal cells divide without control and are able to invade other body tissues. Cancer cells can spread to other parts of the body through the blood and lymph systems. Cancer cells are formed when the genetic material (DNA) of a cell start producing mutations that affects normal cell growth and division by being damaged. When this happens, sometimes these cells do not die but form a mass of tissue called a tumour [1].

According to the World Health Organization, the number of deaths due to cancer, which was just 13% in 2008, is currently having a significant increase and one estimates that this number could reach approximately 12 million until 2030 [2].

Breast cancer is the most common cancer and continues to be a significant public health problem among women around the world [3], and is the second leading cause of female cancer death rate after lung cancer [4]. Breast cancer has the highest incidence of all cancers in the female population [5]. According to Global Cancer Statistics, the most common causes of cancer death are breast cancer and also the most prevalent cancer in the world is breast cancer[6]. The best-known method for preventing breast cancer is early diagnosis, which lowers the mortality rate and enhances treatment efficiency.

There are several ways in which breast cancer can be diagnosed, including self-examination of breast, clinical examination of breast, imaging or mammography and surgery. Mammogram is

the most effective technique for breast cancer screening and early detection of masses or abnormalities; it is usually done by radiologists and can detect 85–90% of all breast cancers [7]. The screening of mammogram image is a sensitive stage, because different radiologists depending on their expertise level can interpret the examinations of same mammogram image differently. So the judgment of mammograms mainly depends on training and experience level of the radiologists.

Also there are a lot of other factors that can affect or influence the analysis of the images like hunger, tiredness, lack of interest, etc. of the radiologist. Moreover, the factors like size and location of the lesion, density of the breast tissue and patient's age etc. are affects the decision making process. So the reliability of analysis of mammograms varies between approximately 70% and 90% [8].

One of the most recent advances in x-ray mammography is digital mammography. Digital mammography produces faster and more accurate digital images. The fast processing of the digital mammography results a significant improvement in patient's comfort and convenience. That is, digital mammography reduces the time to produce images and it turn reduce the time each patient must remains still during the scanning process [9]. And, as the digital mammography images are acquired digitally and it can be displayed immediately on the system monitor.

Computer aided Detection (CADet) systems help radiologists in analyzing and interpreting digital mammograms for detection and classification of abnormalities [10]. Since 65–90% of the biopsies of suspected cancer turned out to be benign, it is very important to utilize CADet that can distinguish benign and malignant lesions. The combination of CADet system and experts' knowledge would greatly improve the detection accuracy. The detection sensitivity without CADet is 80% and with CADet is up to 90% [11].

In this paper a review on the research works in the field of Computer Aided Detections of Digital Mammograms are discussed. The main challenges of this field are determining the precise location and size of the lesions in the digital mammograms. Section II of this paper proposes an approach for general CADet frameworks. Section III of this paper contains a literature review in the field of CADet of Digital Mammograms. Section IV of this paper is conclusion.

## **2. COMPUTER AIDED DETECTION FRAMEWORK**

A general framework for computer-aided detection of breast cancers in digital mammograms is proposed in this section. The block diagram for the proposed framework is shown in Fig.1.



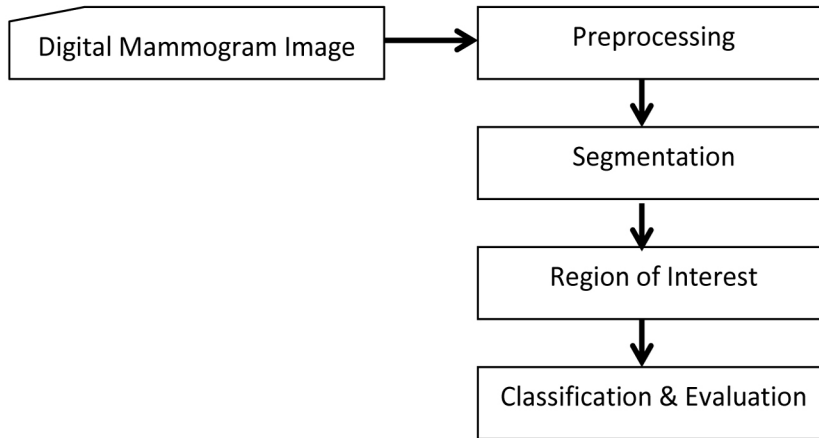


Fig.1: Proposed Framework for Computed Aided Detection

This framework takes digital mammogram images as input and performs preprocessing operations to remove or reduce the noises and artifacts from the images. Then performs segmentation process for differentiating different structures in the images such as lesions. In the next step, it finds out the region of interest (ROI) and every detected region is analyzed individually for special characteristics like size and location. Then finally performs the Classification & Evaluation operations.

### 3. REVIEW OF COMPUTER AIDED DETECTION METHODS

Screening mammography is the best and widely used reliable method for early detection of breast cancer in women without any symptoms [12]. To get accurate results in analysis of mammographic images, the advantages of computers can be used in early detection of breast cancers. That is, Computer-Aided Detection methods are applied in mammographic images to assist radiologists on lesions analysis such as micro calcification, mass and architectural distortions.

Studies indicate that a large number of research works in the area of mammograms were started in the early 1970s. In the mid-1980s, however, medical physicists, radiologists, etc. began major research efforts for Computer Aided Detection (CADet) and Computer Aided Diagnosis (CADiag). That is, using the computer output as an aid to radiologists—as opposed to a completely automatic computer interpretation—focusing initially on methods for the detection of lesions on chest radiographs and mammograms. Since then, extensive investigations of computerized image analysis for detection or diagnosis of abnormalities in a variety of 2D and 3D medical images have been conducted [13]. CADet research includes many aspects—collecting relevant normal and pathological cases; developing computer algorithms appropriate for the medical interpretation task including those for segmentation, feature extraction, and classifier design; developing methodology for assessing CAD performance; validating the algorithms using appropriate cases to measure performance and robustness; conducting observer studies with which to evaluate

radiologists in the diagnostic task without and with the use of the computer aid; and ultimately assessing performance with a clinical trial.

The U.S. Food and Drug Administration (FDA) approved first Computer Aided Detection system for screening mammography was in 1998 [14]. The wide use of Computer Aided Detection system in digital mammograms is started in early 2000s. The research articles shows that many techniques are introduced in recent days to improve the efficiency of Computer-Aided Detections, but still not yet achieved 100% efficiency and accuracy and investigations are happening to improve the performance [15].

M.P. Sampat et al. [16] presented a new algorithm in 2005 for classifying lesions into shape categories: round, oval, lobulated, or irregular. For this classification task, they have developed a new set of features using the Beamlet Transform, which is a multi-scale image analysis transform. They claim that this method obtained a classification accuracy of 78% for classifying masses as oval or round and an accuracy of 72% for classifying masses as lobulated or round.

S. V. Engeland et al. [17] presented a method to improve computer aided detection (CAD) results for masses in mammograms by fusing information obtained from two views of the same breast in 2007. Using correspondence between regions, they extended their CAD scheme by building a cascaded multiple-classifier system, in which the last stage computes suspiciousness of an initially detected region conditional on the existence and similarity of a linked candidate region in the other view. A statistically significant improvement was found in the lesion based detection performance. At a false positive (FP) rate of 0.1 FP/image, the lesion sensitivity improved from 56% to 61%. But case based sensitivity did not improve.

Jun Wei et al. [18] developed a computer-aided detection (CAD) system that combined a dual system approach with a two-view fusion method to improve the accuracy of mass detection on mammograms in 2009. A two-view fusion score for each object was generated by weighting the similarity measure with the cross correlation measure of the object pair. With this new two-view dual system approach, the average case-based sensitivities were improved around 17 to 20% for average masses.

In 2011, B. Surendiran et al. [19] presented a classification system for the malignant and benign masses present in mammogram using Hue, Saturation and Value (HSV) weight function based statistical measures. The weight function is robust against noise and captures the degree of gray content of the pixel. The statistical measures use gray weight value instead of gray pixel value to effectively discriminate masses. The PASW data mining modeler has been used for constructing Neural Network for identifying importance of statistical measures. The experimental results were found to be encouraging. Also, the results will agree to the standard specified by the American College of Radiology-BIRADS Systems.

A. Vadivel et al. [20] proposed a fuzzy rule-based approach for characterization of mammogram masses into shape categories in 2013. It uses geometric shape and margin features for classifying

mammogram mass lesions into four main shapes categories: round, oval, lobular and irregular. They states that their approach is twice effective than Beamlet based features [16] for classifying the mass as round, oval, lobular or irregular.

Danilo Cesar Pereira et al. [21] recommended a set of computational tools to aid segmentation and detection of mammograms in 2014. They have first implemented an artifact removal algorithm and followed by an image de-noising and gray-level enhancement method based on wavelet transform and Wiener filter. Finally, a method for detection and segmentation of masses using multiple thresholding, wavelet transform and genetic algorithm is employed in mammograms, which were randomly selected from the Digital Database for Screening Mammography (DDSM). The authors claim that their experiments have a strong potential to be used as the basis for mammogram mass segmentation.

Year	Authors/Citation	Methods Used	Results/Advantages
2005	M.P. Sampat, A.C. Bovik, M.K. Markey [16]	Used the multi-scale transform method called Beamlet Transform to classify the lesions into shape categories: round, oval, lobulated, or irregular.	Obtained a classification accuracy of 78% for classifying masses as oval or round and an accuracy of 72% for classifying masses as lobulated or round.
2007	S.V.Engeland, N.Karssemeijer [17]	A cascaded multiple-classifier system is used in this method to fuse information obtained from two views of the same breast.	Improvement in the lesion based detection performance at a false positive rate of 0.1 per image, the lesion sensitivity improved from 56% to 61%. But case based sensitivity did not improve.
2009	Jun Wei et al. [18]	Used a system that combined a dual system approach with a two-view fusion method to improve the accuracy of mass detection.	The average case-based sensitivities were improved around 17 to 20% for average masses.
2011	B. Surendiran et al. [19]	Used a classification system for the malignant and benign masses present using Hue, Saturation and Value (HSV) weight function based statistical measures. The PASW data mining modeler has been used for constructing Neural Network for identifying importance of statistical measures.	The results were found to be encouraging and agrees to the standard specified by the American College of Radiology (BIRADS) Systems.

2013	A. Vadivel et al. [20]	Used fuzzy rule-based approach for characterization of mammogram masses into shape categories. Also used geometric shape and margin features for classifying mammogram mass lesions into four main shapes categories: round, oval, lobular and irregular.	Their approach is twice effective than Beamlet based features [16] for classifying the mass as round, oval, lobular or irregular.
2014	Danilo Cesar Pereira et al. [21]	Recommended a set of computational tools to aid segmentation and detection of mammograms. The artifact removal, image de-noising and grey level enhancement methods are based on wavelet transform and Wiener filter.	Their experiments have a strong potential to be used as the basis for mammogram mass segmentation.

Table 1: A review on computer aided detection approaches for breast cancer in digital mammograms.

#### 4. CONCLUSION

As the technology advances imaging systems become more complex and there is a demand for better methods for the retrieval of quantitative information from images. However the problems in computer aided detections and diagnostics are not completely solved. That is, still there is an increasing demand for higher accuracy and reliability in the methods to identify the masses and calcifications from digital mammographic images for the early detection of breast cancers in women. Currently, the research works are focusing on automatic segmentation system of suspicious lesions for mammographic images and the discrimination and classification of regions extracted from mammograms like masses, calcifications, architectural distortion and bilateral asymmetry. The above review also shows that there are little works have been reported to be carried out in the area of computer aided detection system that utilizes the applicability of different imaging methods and algorithms to identify the masses and calcifications and the future works in computer aided detections area will be to identify the exact shape and size of the cancerous regions.

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# GSM Controlled Integrated Robot

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**Abstract**— Robots are generally a boot which are modeled, planned, sensed, actuated and controlled whose motion and behavior can be influenced by “programming”. When a robot is controlled using RF technology, the inherent limitations of the technology such as limited working range causes problems in controlling robots. The GSM Controlled Integrated Robot is an electromechanical machine which doesn't need any kind of “programming”. The inherent limitations of RF circuits can also be overcome when mobile phones can be used to control robots. In this paper a model using Dual Tone Multi Frequency (DTMF) which decodes the signal, from GSM Module which controls the boot and helps to move along forward, backward, left, right direction and along 360 degree rotation, is discussed.

**Keywords**— Robot, boot, GSM Controlled Robot, DTMF

## I. INTRODUCTION

Robots can be controlled in a wireless environment. A wireless controlled Robots make use techniques such as Remote, Bluetooth, Wi-Fi that are based on RF circuits. RF circuits have few inherent limitations such as limited working range, limited frequency range and limited control [1][3]. This is a hindrance in controlling and navigating a robot within a long perimeter.

One of the ways to circumvent this issue is use of mobile phones to control the robots. When the robot is connected to GSM modem which is controlled by user mobile phone, the robot can be controlled using the mobile phone with a working range as large as the area of the service provider. Also it has no interference with other controllers. This approach is a handy solution to all the limitations of RF circuit-based methods. A general concept of mobile controlled robot is that it can be controlled from any part of the world with just an inclusion of a camera.

The remaining portions of this paper are organized as follows: Section II briefly discusses about the components of the proposed system using mobile phones. In Section III, a brief technical application of the proposed architecture is discussed. Section IV is about merits, demerits and applications of the proposed method. Section V concludes the paper.

## II. COMPONENTS OF THE PROPOSED SYSTEM

The robot which can controlled by 2 mobile phones one phone as in robot and other one is like a remote. To avoid extra camera building in the robot we use the receiving end mobile camera by using video call. It can be work any range where we have a mobile network.

Button	Low DTMF Frequency (Hz)	High DTMF Frequency (Hz)	Binary Coded Output			
			Q1	Q2	Q3	Q4
1	697	1209	0	0	0	1
2	697	1336	0	0	1	0
3	697	1477	0	0	1	1
4	770	1209	0	1	1	1
5	770	1336	1	0	0	0
6	770	1477	1	0	0	1
7	852	1336	1	0	0	0
8	852	1336	1	0	0	0
9	852	1477	1	0	0	1
0	941	1366	1	0	1	0
*	941	1209	1	1	0	0
#	941	1477	1	1	0	0

Table I: DTMF Codes

Any mobile phone can be used as a remote and receiver. When a mobile phone button is pressed to make a call, tone corresponding to the button pressed is heard at the other end of the call. This tone is called Dual Tone Multiple-Frequency (DTMF) tone. This DTMF tone is caught by the robot with the help of the phone attached to the robot. The modulation of sound is taking as an input. For every button the frequency is different (See Table 1) and this frequency is decoded using an DTMF decoder IC.

The components of the system are:

- GSM module,
- DTMF decoder (MT8870),
- Motor driver (L293D),
- Camera,

- Gear motor, and
- Tyres.

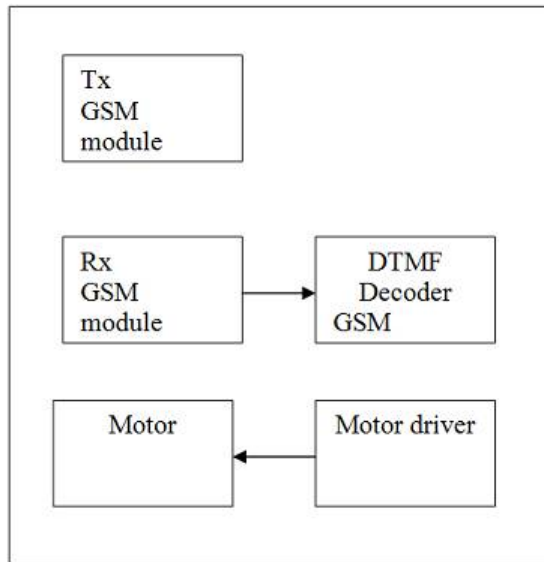


Fig 1: Block Diagram of the Proposed System

#### A. GSM Module

It does the function of both receiving and sending the signals which helps to make a video and audio call over the phone. The normal robots are being controlled over limited Radio Frequency range but these GSM controlled robots are controlled using the mobile networks which expands its limitation, and make it a wide range controlled boot.

#### B. GSM Module DTMF Decoder (MT8870)

The DTMF receiver's main function is to decode the input signal. DTMF receiver integrates both the band split filter and digital decoder functions.

It is the frequency produced when different keys from a remote mobile device is pressed while connecting a call.

#### C. Motor Driver (L293D)

This device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays, solenoids, DC and stepping motors) and switching power transistors.

#### D. Gear Motors

The gear motors are the normal motors which are being attached with gears that drive the shaft. The maximum power of the motor is 200 rpm.

#### E. Camera

A camera is attached to the GSM controlled integrated robot.

### III. DISCUSSION

The GSM Controlled Integrated Boot can be activated by making a video and audio call from the mobile phones and then by pressing the numbers in the keypad. The DTMF tones generated are sent to GSM module which receives the signal and, the signal is sent to the DTMF module. The DTMF module decodes the signal and passes it to motor driver. As per the signal, the motor driver instructs the gear motor to move. since logical IC MT8870 is used, instead of a microprocessor, without writing a program the robot can be controlled.

### IV. DISCUSSION

#### A. Merits

1. The GSM Controlled Integrated Robot is cheaper compared to other similar devices.
2. It doesn't require "programming".
3. It can be controlled by GSM network over wide range.
4. As this boot is being controlled using GSM network, the receive calls can be preset, and it more secure.

#### B. Demerits

1. It can't be airborne.
2. It can't dodge gait objects as this boot is tiny.
3. As once the video call gets disconnected, another call is be made to connect the interface.

#### C. Applications

There are several applications for this technology which includes:

- GSM based home appliance control
- GSM based home security system
- GSM based generator start stop.

### V. CONCLUSION

The GSM Controlled Integrated Robot can be used as alternative to RF circuit based robot controlling. Compared to the limited range of RF based circuits, GSM controlled robots can work in a wide range – range is constrained by the mobile service operator's vast perimeter range. DTMF encoding and decoding techniques are applied to exchange commands between robots and the machine. Use of logical IC MT8870 enables the system to be used without any programming. The



system has a wide range of applications in areas such as military, medicine, industries, and space exploration.

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**DIVERSITY AND ABUNDANCE OF ODONATA AND THEIR ASSOCIATION TO HABITAT VARIABLES IN KADALUNDI - VALLIKUNNU COMMUNITY RESERVE, MANGROVE FOREST ECOSYSTEM, SOUTH WEST COAST, KERALA, SOUTH INDIA.**

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***Abstract***

Odonates are biological indicators and relatively little information is available on environmental associations and the conservation of Odonates in mangrove estuarine environment. Therefore an attempt is made to study diversity, abundance, habitat preference, seasonal variation and impact of environmental factors on Odonates distribution in Kadalundi estuary during the period from August 2004 to July 2006. The Kadalundi estuary is a part of Vallikunnu Community Reserve, the first of its kind in India located in between The study area was divided into 3 sites based on the difference in the distribution of vegetation and human disturbances. Standardized survey methodology for Odonates involved periodical counts over selected study sites. Habitat variables such as air temperature, water temperature, pH, Salinity, were studied and analysed through a multivariate approach. A total of 605 individuals of 23 species of Odonates belonging to 4 different families and 9 subfamilies were recorded. The maximum number of individuals is seen in site II since this area is being protected and also with sufficient vegetation with least disturbances. The Odonates population is peak in monsoon and least in winter. Of the 23 species of Odonates identified, *Acisoma panorpodes panorpoides* is the most abundant species (n= 96), followed by *Neurothemis tullia tullia* (n = 89), *Brachythemis contaminata* (n =72). The air temperature and soil temperature has a significant effect on the abundance of Odonates, contribute the main factors that determine the distribution and abundance of Odonates. The pH and salinity variation also determine their assemblage. The distribution pattern of Odonates clearly indicates the seasonal variation among the species diversity and abundance. Availability of vegetation, salinity and disturbances impart variation in species richness and equitability in the distribution of odonates in this mangrove estuarine environment.

Key words: - *Odonata, Mangrove, Estuary, Species richness, Equitability*

## INTRODUCTION

Mangroves are one of the ecologically important wetland ecosystems found in the inter-tidal zones of estuaries in tropics and subtropics (Tomlinson 1986, Ricklefs and Lantham 1993). Odonates are an important amphibiotic invertebrate group comprising damselflies and dragonflies. Odonates were the first insect group that has been globally assessed (Clausnitzer *et al.*, 2009). Studies on Odonates have been extensively carried out in India (Fraser, 1933, 1934, 1936; Prasad & Varshney, 1995, Subramanian. K.A, 2005; Emiliyamma, 2010 & 2012, Asaithambi. M, S.Manickavasagam, 2002, Kandibane. M et al., 2003) but studies on their distribution and association with environmental factors especially in mangroves and estuarine ecosystem is scanty. Among the essential tools in ecological assessments in the land water interface characterization of the odonate communities (Dragonflies and Damselflies) has been a widely accepted tool (Sahlen and Ekestubbe, 2001; Chovanec & Waringer, 2001; Schindler *et al.*, 2003).

Dragonflies have been proposed as indicators to assess the ecosystem health of freshwater wetlands (Suhling *et al.*, 2006) and they are bio-indicators in natural ecosystems (Samways & Steytler, 1996; Chovanec & Waringer, 2001; Smith *et al.* 2007; Silva *et al.* 2010) and serve as an umbrella species in biodiversity conservation (Noss, 1990; Lambeck, 1997). Odonates require a wide range of functional and structural features of a particular habitat for their survival and reproduction (Tockner and Ward, 1998). Habitat heterogeneity especially the quality and quantity of aquatic and semi-aquatic plant communities, shoreline structures, hydrological features and sunlight are the most important variables determining the appearance of odonate species or associations (Lenz, 1991; Moore, 1991; Corbet, 1999). The site selection, seasonal variation and effect of salinity, air and soil temperature, pH on odonate assemblage have been studied.

## MATERIALS AND METHODS

The Kadalundi estuary (11°7'28"– 11°8'01"N and 75°49'36"–75°50'20"E) is located at the mouth of the river Kadalundi that drains into the Arabian Sea on the west coast of Kerala (Plate 1 & 2). Before entering the sea, it divides into two channels encircling a small island. The raised sandbars on the western and southern sides of the island separate the lagoon from the fidgety sea. Apart from scattered patches of mangroves, the estuary is bordered by human habitation and coconut groves. Around 8 ha of mudflats, exposed during low tides, offers potential foraging ground for several hundreds of wintering and resident water-birds, particularly waders (Aarif et al. 2011). It also provides significant socio-economic and livelihood services for the people around (fishing, oyster farming and sand mining). Two bridges, one each for road and rail, intersect the estuary on the western and eastern sides of the mudflats respectively.

It is covered with extensive patches of mangrove vegetation. Among the mangrove species found in the estuary, *Acanthus ilicifolius* is the predominant one followed by *Avicinia officinalis*. Most common mangrove associated species of plants are *Premna latifolia*, *Cerbera manghas*, *Callophyllum inophyllum*, *Morinda nerifolia* and *Derris trifoliata*. The area harbours rich faunal composition and an important stopover habitat of migrant species of birds.

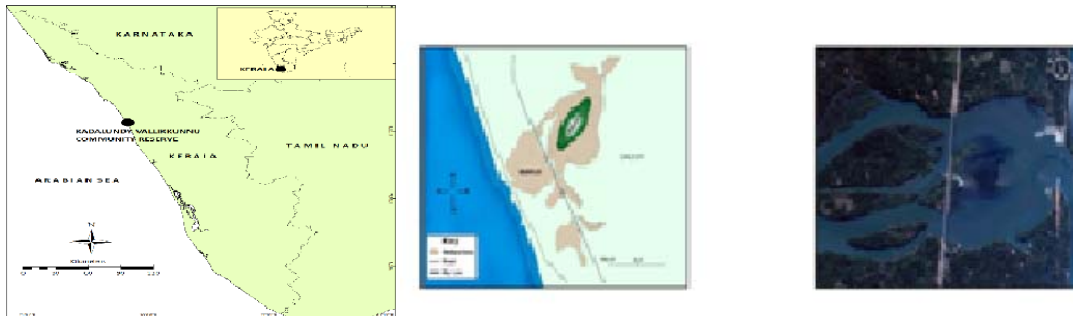


Plate-1 Location and satellite View of Study Area

Three vegetationally different areas were selected. Sampling was carried out from August 2004 to July 2006. Collections were done in four seasons namely winter, summer, monsoon and post monsoon. The samples collected between 9.00 am and 12.00 pm once in a week. Three selected sites named as site I (area is surrounded by rich mangroves) site II (rich in vegetation with less mangrove patches) and site III (low natural vegetation with disturbances). Odonate species were observed visually and sample collections made with insect catching nets. Collected and photographed species were identified with the help of standard pictorial guides (Subramanian, K.A., 2005, Emiliyamma, K.G et.al, 2005). Physico-Chemical parameters such as air temperature, Soil temperature PH and salinity also recorded. Relative density and ANOVA test were used for analysis.

## RESULTS AND DISCUSSIONS

A total of 605 individuals of 23 different species of odonates belonging to 4 different families and 9 subfamilies were recorded (Table 1). Odonates belonging to the family Libellulidae dominate in all the sites in all seasons. Libellulidae were relatively diverse (78.26%) with 18 species followed by Coenagrionidae (13.04%) with 3 species. Only one species each was observed from the families Lestidae and Aeshnidae.

The odonate assemblage and species evenness varied according to the structure of the sites. Maximum number of individuals is seen in site II (n=378). This area is being protected and disturbance is least with sufficient undergrowth that imparts high abundance of odonate species. Sufficient light and warm climate probably factors contributed high species richness and density of the species since they are light loving creatures. Corbet and May (2000) observed a strong correlation between warm conditions of the habitat and odonate assemblage. The low salinity of water also favours high abundance of this group. High salinity, less ground vegetation and disturbances in the areas I (n=114) & III (n=113) reduces the dispersal and preference to these sites. Being as an indicator of environment, odonates are sensitive towards their surroundings and changes in their ambience may lead to the changes their status (Sunit Kr. Das *et al.*,2012) The life cycle of odonates directly correlated with water parameters especially salinity. They show some preferences to specific habitats and their distribution are very much involved in various microhabitats (Sheldon, G. and K.E. Walker, 1998). The most dominant species recorded from the study area I were *Orthetrum sebina sebina* and *Rhyothemis variegata variegata*. *Acisoma panorpodes panorpodes* and *Neurothemis tullia tullia* were dominant in the study area II while *Neurothemis tullia tullia* and *Acisoma panorpodes panorpodes* were abundant in the third site.

Table 1: List of Odonates recorded

S.No.	Sub order	Family	Sub Family	Scientific Name
1	Zygoptera	Coenagrionidae	Psuedagrioninae	<i>Ceriagrion cerinorubellum</i>
2	Zygoptera	Coenagrionidae	Psuedagrioninae	<i>Ceriagrion coromandelianum</i>
3	Zygoptera	Coenagrionidae	Psuedagrioninae	<i>Psuedagrion microcephalum</i>
4	Zygoptera	Lestidae	Lestinae	<i>Lestes elatus</i>
5	Anisoptera	Aeshnidae	Aeshninae	<i>Anax guttatus</i>
6	Anisoptera	Libellulidae	Sympetrinae	<i>Nurothemis tullia tullia</i>
7	Anisoptera	Libellulidae	Sympetrinae	<i>Nurothemis fulvia</i>
8	Anisoptera	Libellulidae	Sympetrinae	<i>Acisoma panorpoides panorpoides</i>
9	Anisoptera	Libellulidae	Sympetrinae	<i>Brachythemis contaminate</i>
10	Anisoptera	Libellulidae	Sympetrinae	<i>Bradinopyga geminate</i>
11	Anisoptera	Libellulidae	Sympetrinae	<i>Crocothemis servilia servilia</i>
12	Anisoptera	Libellulidae	Sympetrinae	<i>Diplacodes trivialis</i>
13	Anisoptera	Libellulidae	Sympetrinae	<i>Rhodothemis rufa</i>
14	Anisoptera	Libellulidae	Trithemistinae	<i>Trithemis festiva</i>
15	Anisoptera	Libellulidae	Trithemistinae	<i>Trithemis pallidinervis</i>
16	Anisoptera	Libellulidae	Libellulinae	<i>Lathrecista asiatica asiatica</i>
17	Anisoptera	Libellulidae	Libellulinae	<i>Orthetrum sabina sabina</i>
18	Anisoptera	Libellulidae	Libellulinae	<i>Orthetrum pruinosum neglectum</i>
19	Anisoptera	Libellulidae	Trameinae	<i>Rhyothemis variegata variegata</i>
20	Anisoptera	Libellulidae	Trameinae	<i>Tholymis tillarga</i>
21	Anisoptera	Libellulidae	Trameinae	<i>Zyxomma petiolatum</i>
22	Anisoptera	Libellulidae	Urothemistinae	<i>Aethriamanta brevipennis</i>
23	Anisoptera	Libellulidae	Brachydiplactinae	<i>Brachydiplax chalybea chalybea</i>

Of the 23 species, *Acisoma panorpodes panorpodes* (RD- 15.87) was most abundant species (n=96), followed by *Neurothemis tullia tullia* (RD = 14.71) with species evenness 89 and *Brachythemis contaminate* (RD= 11.9) with number of individuals 72 (Table 2). *Lestes elatus* with relative density of 0.33. The *Anax guttatus* observed only once, from study area II probably due to the paucity of aquatic vegetation. Normally it prefers to reside in open pond and lakes with abundant aquatic vegetation. *Pseudagrion microcephalum* is the migratory species. It migrates in large numbers with *Pseudagrion decorum* along the West coast, during October and September.

In all seasons odonates are widely distributed. The frequency of occurrence of odonates varied according to the season without significant changes in the species richness. However the species equitability considerably varied (P = 0.035). Out of 23 species 22 species were observed during rainy months and minimum of 12 species during winter season. Maximum number of individuals was observed during post monsoon (236) and Monsoon months (155). The number of individuals reduced during summer (127) and winter (87) months (Fig.1 -5). The seasonal variation probably due to availability of bushes was high during monsoon months and they are flying from sub marginal plants to plants as well as some water plants. Habitat structure, such as marginal vegetation, is very important for all dragonfly species (Niba & Samways, 2006).

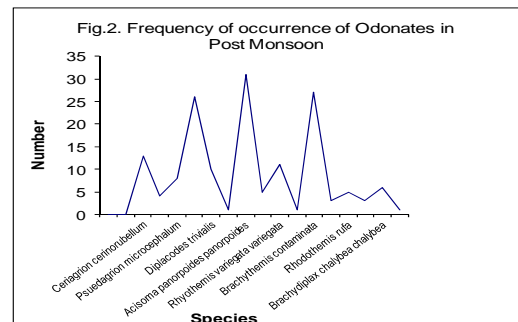
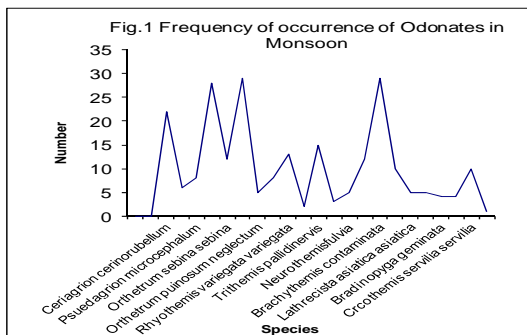
The odonate assemblage can be probably credited to structure and composition of habitat and water parameters. Stagnant water and slow moving water bodies might impart better breeding locations of many odonate species (Bond et. al., 2006). The frequency of odonates was high in study area II irrespective to the seasons. All Odonates

are found close to fresh water although adult dragonflies often venture out for some distance over land, foraging for food (Kandibane. M et al., 2003).

Rapid and distinct seasonal changes of different environmental parameters effectively determine the species composition and the distribution pattern of organisms (Jayachandran. P.R et al, 2013). The air and soil temperature attained maximum during summer months and gradually decreased towards rainy months. A decreasing trend in salinity from summer months towards rainy months attributed the variation in the assemblage of odonate species in the selected sites. The environmental parameters such as air temperature and soil temperature significantly vary over seasons. The air temperature ( $P = 0.025$ ) and soil temperature ( $P = 0.001$ ) have a significant effect on the abundance of Odonates in different areas of Community Reserve.

Table- 2. Distribution profiles of Odonates

S. No	Scientific name	Frequency of Sightings			Total	Relative Density
		Site1	Site2	Site3		
1	<i>Ceriagrion cerinorubellum</i>	3	33	13	49	8.1
2	<i>Ceriagrioncoromandelianum</i>	0	7	3	10	1.65
3	<i>Psuedagrion microcephalum</i>	0	17	2	19	3.14
4	<i>Neurothemis tullia tullia</i>	8	57	24	89	14.71
5	<i>Orthetrum sebina sebina</i>	17	11	2	30	4.96
6	<i>Acisoma panorpoides panorpoides</i>	2	75	19	96	15.87
7	<i>Orthetrum puinosum neglectum</i>	6	8	7	21	3.47
8	<i>Rhodothermis rufa</i>	9	17	1	27	4.46
9	<i>Rhyothemis variegata variegata</i>	16	15	2	33	5.45
10	<i>Zyxoma petiolatum</i>	0	2	0	2	0.33
11	<i>Trithemis pallidinervis</i>	14	13	0	27	4.46
12	<i>Trithemis festiva</i>	3	0	1	4	0.66
13	<i>Neurothemis fulvia</i>	2	11	2	15	2.48
14	<i>Diplacodes trivialis</i>	8	22	9	39	6.45
15	<i>Brachythemis contaminata</i>	6	48	18	72	11.9
16	<i>Brachydiplax chalybea chalybea</i>	7	18	0	25	4.13
17	<i>Lathrecista asiatica asiatica</i>	1	6	1	8	1.32
18	<i>Tholymis tillarga</i>	5	5	3	13	2.15
19	<i>Bradinyopyga geminata</i>	0	3	1	4	0.66
20	<i>Aethramanta brevipennis</i>	3	2	2	7	1.16
21	<i>Cocothemis servilia servilia</i>	4	5	3	12	1.98
22	<i>Lestes elatus</i>	0	2	0	2	0.33
23	<i>Anax guttatus</i>	0	1	0	1	0.17



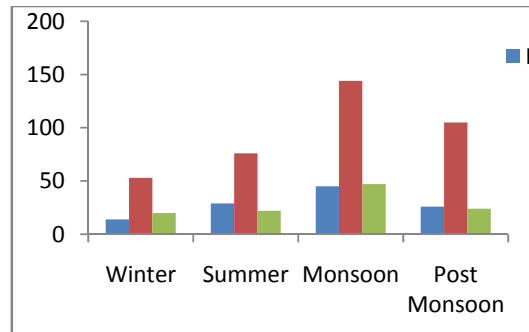
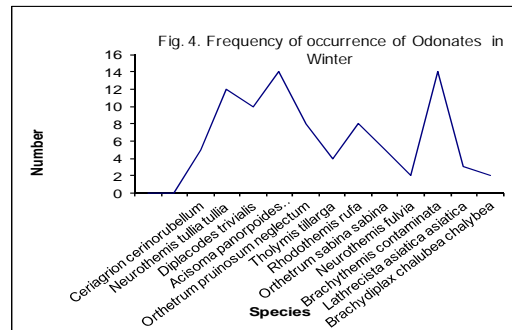
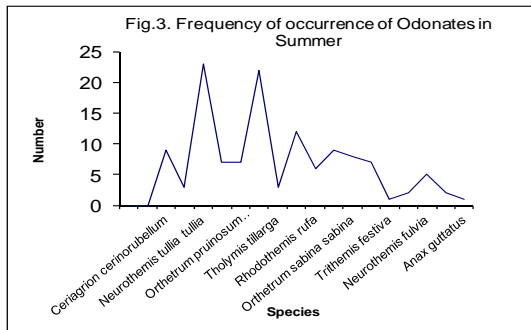


Fig. 5 Seasonal variation in the frequency of occurrence of Odonates



The human pressure like destruction of mangroves, husk retting, sand mining, sewage disposal, mussel collection, construction works, were major factors that can contribute the loss of biodiversity especially one of the most sensitive group of animal kingdom, performing major role in trophic level for the sustenance of a healthy ecosystem. A minor perturbation in the structure of the habitat negatively affects entire floral and faunal composition especially if it is a most complex fragile estuarine mangrove ecosystem. Further studies are recommended since this area is getting more protection after the declaration as Community Reserve, the first of its kind in India.

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## SEA-CUCUMBERS AND ANIMAL ASSOCIATIONS AT KAVARATTI ISLAND

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### ABSTRACT

The Capital of Union territory of Lakshadweep, Kavaratti is not yet deeply explored for its biodiversity. Holothurians from Kavaratti Island is least known and hence this attempt during the period from March,2014 to May,2014. Sea cucumbers show interesting associations with other animals such as, *Lissocarcinus orbicularis*, *Eriphia sebana*, Hermit crab & gastropods. Several animal associations with Holothurians were able to record during the study period and of these *Grapsus albolineatus* associate with *H.cinerascens* are reported for the first time. A total of 5 species of holothurians under the 3 genera and a single family (Holothuriidae) were identified. They were *A .mauritiana*, *H.atra*, *H.leucospilota*, *H.cinerascens* and *Bohadschia* species. Out of these, *Bohadschia* species already reported that it represents the Kavaratti Island only.

**Key Words: Holothurians, animal association, Symbiosis**

### INTRODUCTION

When two or more kinds of organisms interact with an elaborate and a permanent relationships, it is called Symbiosis. All symbiotic relationships carry the potential for co-evolution between the organisms involved and in many instances the results of this co-evolution are fascinatingly complex. In the Echinoderm phylum more than 800 different animal associations are so far reported (Lyskin and Britaev 2005), and the class Holothuroidea has the highest number of associations (Eeckhaut et al. 2004). Recently, pearlfishes are reported to be able to live in association with different invertebrates, including holothurians(Mercedes González-Wangüemert et. Al., 2014).

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Hence the ecological associations of seacucumbers from the Kavaratti island is done to find out the qualitative estimation of this kind of associations.

Sea Cucumbers are the Spiky-skinned, sessile and sedentary animals of the sub-phylum Echinozoa and the class Holothuroidea. The name sea-cucumber derived from Pliny's term *Cucumis marinus*. Holothurians though distributed all along the Indian Coast are concentrated more along the southeast coast of India especially in the Gulf of Mannar and Palk Bay & in Andaman and Nicobar Islands. Economic importance of Seacucumber varies between as a source of protein food, aphrodisiac and having curative properties for ailments such as blood pressure, cancer and muscular disorders. Lakshadweep resource was estimated by James (1989) and reported 3000 to 5000 tonnes of *Holothurian nobilis* and *Bohadschia argus* could be collected when we take whole Islands into consideration. But from the exploitation point of view these are untapped potential so far. Kavaratti is the most centrally located Island in the Lakshadweep Archipelago, with a land area of approximately 4.22 sq. km. The island of Kavaratti lies 360km off the coast of Kerala at 10.57°N 72.62°E.

### MATERIALS AND METHODS

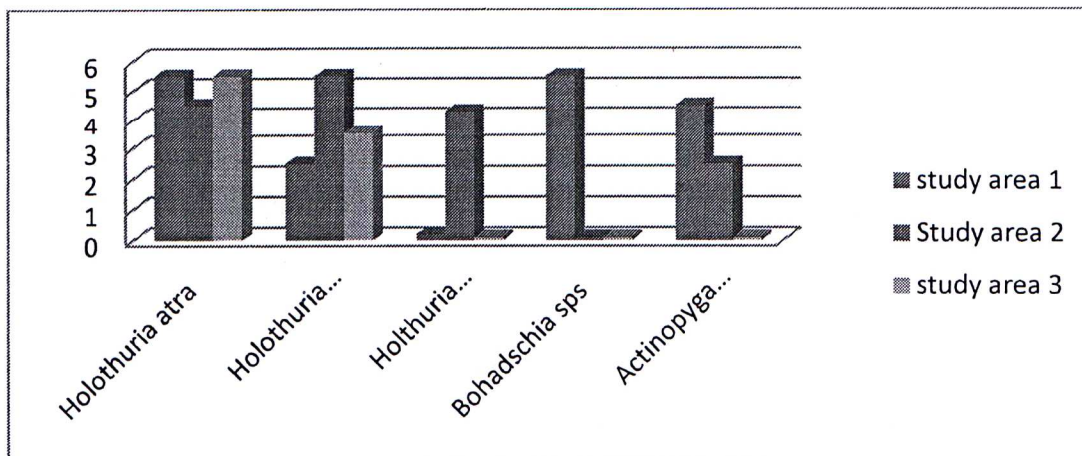
Collection of holothurians and water samples were made during early morning and day preferably during low tide, but sometimes collected during high tide also. Collected species was identified by their natural colors, other external morphology of tentacles, tubercles, pedicels, tube feet etc using various monographs, taxonomic keys and discussing with the experts (Clark, 1971, Daniel & Halder, 1974, Fisher, 1907, etc). Temperature recorded by a centigrade Thermometer at the sampling site. Sediments were collected for analysis of sand particle size, organic carbon and faunastic composition at the laboratory. For the permanent storage, the specimens were transferred into 70% denatured alcohol. Photographs are taken for the further study.



## RESULT & DISCUSSION

The maximum and minimum surface temperature of lagoon waters recorded during 24 hours was 31.5<sup>0</sup>C and 28.2<sup>0</sup>C. The atmospheric temperature was in the range of 25<sup>0</sup>C to 31<sup>0</sup>C. In the lagoon the maximum salinity value of 34.4% was recorded at 20.00 hrs and the minimum of 29.5% was noticed at 08.00 hrs. In the open sea the salinity of surface sea water was 32.28 to 32.45%. The minimum and maximum value of dissolved oxygen is recorded from the surface waters lagoon were in the range 2.54/ml/litre to 6.1ml/litre. In the surface waters of open sea it was 5.51 ml/litre. The estimated gross and net productivity values of lagoon waters of Kavaratti during March were 294.44 mg C/m<sup>3</sup> per day and 48.59 mg/m<sup>3</sup> per day respectively. The average displacement volume of plankton collected from lagoon is 3.33ml. Decapod larvae constituted 50.42%, copepods 25.50%. Fish eggs 17.38% and chaetognath 2.63%. The other organisms which occurred less than 5% were copepods, amphipods, & appendicularians. In the open sea samples collected outside the reef area, copepods were dominant (55.25%) and decapods larvae formed 22.50% followed by fish eggs which constituted 10.00%.

The present study in Kavaratti Island revealed a total of five species of holothurians under three genera and a single family (Holothuriidae). Of these, a species named *Bohadschia species* already reported that it represents Kavaratti Island only. *Holothuria atra* and *Holothuria leucospilota* species was maximum (85.4%) and *Actinopyga mauritiana*, *Bohadschia* and *Holothuria (Semperothuria) cinerascens* species are in observed minimum (31.2%). These five species of holothurians was recorded from southwest (4), eastern side (2) and southeast (4) as study area 1, study area 2 and study area 3 respectively.



**Figure.1 Mean percentage of cover of Holothurians at study area 1, study area 2, Study area 3**

The shallow water holothurians community at the three study sites at Kavaratti showed very low species diversity during the study period. This might be attributed to distributional changes in the species composition as reported by James (1986). During his study on the distribution of Indian echinoderms, it was noted that some species, which were absent at a particular place, were found to be common after a few years and vice versa. Notably James (1986) could not find a single specimen of *Holothuria crinaceus* and *Phyrella fragilis* in south point of Port Blair during 1965, however, these species were found to be common in the same locality during 1975. Similarly, Baskaran & Satyamoorthy, 1989 reported *Stichopus chloronotus* to be common around Rameswaram but during years 1963 to 1968 when intensive collections were made not a single specimen of the above species as seen around Rameswaram. This condition also occur in the case of *Holothuria cinerascens*, early this species recorded only in the south west Australia, during this study *H. cinerascens* species observed in the eastern side of the Kavaratti island. All this shows that some changes in the species composition have take place time to time and it is very difficult to predict the factors that contributed to the changes. Detailed investigations on seasonal changes, reproduction, spawning behavior, longevity, fecundity and zoogeography of holothurians will be help full to draw management strategies for conserving these declining resource. Sea cucumbers show interesting association with other animals, the classic example being that of

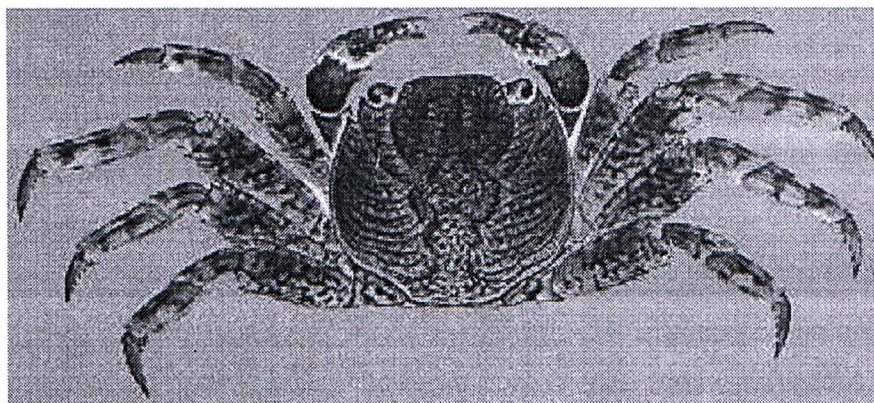


Carapid fishes with sea-cucumbers. Recorded *Lissocarcinus orbicularis* is found to live in association with sea-cucumber *Bohadshia species*. And also observed *Eriphia sebana*, Hermit crab and *Gastropods* associated with *Holothuria atra* and *Holothuria leucospilota*. These associations are excellent for both crabs and sea-cucumbers i.e. commensals. The crab is white with brown patches and it is well camouflaged on the species of sea-cucumber which is white with brown patches in *Bohadshia species*. When *H. atra* is handled in the live condition a red-colored material come out. This is the toxin known as holothurin. The Associations of sea cucumbers with other organisms are tabulated below.

**Table 1 Associations of sea cucumbers with other organisms**

Species	Animal associated noticed
<i>Holothuria atra</i>	<i>Eriphia sebana</i>
<i>Holothuria leucospilota</i>	<i>Eriphia sebana</i>
<i>H.cinerascens</i>	<i>Grapsus albolineatus</i>
<i>Bohadshia species</i>	<i>Lissocarcinus orbicularis</i>

The *Grapsus albolineatus* associate with *H.cinerascens* are reported for the first time. All other associations are so far reported. These associations are mainly for the benefit of both the organisms involved. These organisms may have the potential for co-evolution but not yet confirmed. As the association between *Grapsus albolineatus* and *H.cinerascens* are reported for the first time, they are described in detail here.

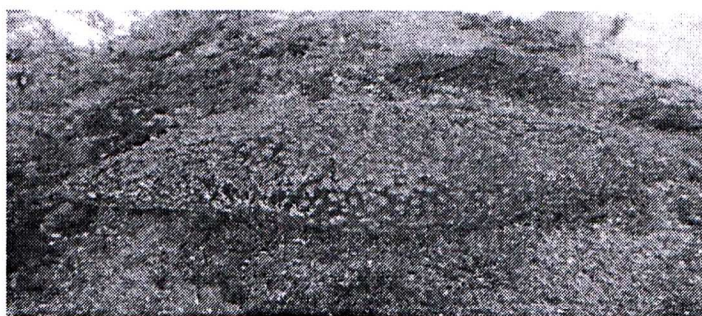


**Fig 1 *Grapsus albolineatus* Lamarck, 1818 Identification Key**



Sub acute and keeled tooth at inner angle of orbit; tooth at inner angle of wrist of cheliped straight. First and last pair of legs equal in their length, distal part of posterior margin of last leg dentate.

The carapace branchial grooves are not so well cut, the transverse and oblique ridges are low and smooth, and the surface between the oblique ridges is quite smooth. The front is not so deep and is obliquely deflexed, hardly overhanging the epistome and not concealing the antennules, and its free edge is not so distinctly crenulate. The tooth at the inner angle of the orbit is subacute. The length of the epistome is not nearly a third its greatest breadth. In the chelipeds, the tooth at the inner angle of the wrist is nearly straight, not talon-like, the length of the upper border of the palm is nearly two thirds the length of the dactylus and the tips of the fingers are not so broad and blunt. In the legs the meropodite is broader, its greatest breadth being half its length.



**Fig 2** *Holothuria (Semperothuria) cinerascens* Brandt, 1835.

### Identification Key

*H. (Semperothuria) cinerascens* is a red-brown to purple sea cucumber. It is a small to medium-sized species (to 160 mm), rather slender and cylindrical, with a soft and thick body wall and 20 tentacles. Its spicules are finely spinose rods (*H. cinerascens* spicules), and tables with a reduced disc, but bearing a characteristic maltese cross.

Holothuroidea especially *H. cinerascens* are closely associated with sea-urchins, *Stomopneustes variolaris* and *Echinometra mathrei* which are locally common (Kalk, 1958). Several small animals can live in symbiosis with sea cucumbers. The tegument of sea cucumber is a habitat for some

cleaner shrimbs like *Periclimenes* species. The pearl fishes have evolved a communalistic symbiotic relationship with sea cucumbers in which they live in sea cucumber's cloaca thus protected from predation and also utilize the nutrients from that region as food. There are ecto and endo parasites too living with this leathery skinned marine echinoderm. Many polychaete worms and crabs have make use of the mouth or the cloacal respiratory trees for protection by living inside the sea cucumber except for *Actinopyga* which have anal teeth to prevent viitors from penetrating their anus. Their endocommensals include some bivalvia species such as *Entovalva*.

### CONCLUSION

There is no depth study the status of holothurians in Kavaratti Island. This has to be initiated by the department of environment and forest and department of science and technology and CMFRI. There should be a comprehensive plan to enforce stoppage of disposal of pollutants by ship pollutants from the Islands. People have to be aware the laws which pertain to the protection of coastal region. The exploitation of holothurians will not be an economical of proposition and at the same time bring about deterioration in the ecosystem. Sanitary conditions should improve and a public awareness has to be created among the local people against polluting beaches. There have to be constant awareness programmes which will instill the need for conservation of the coastal environmental education programmes should be initiated from the primary level onwards so that a child grows up sensitive to the Island environment. Further studies using molecular markers will allow us to improve our knowledge of this species, particularly with regard to its genetic connectivity and diversity and possible links with its hosts.

### ACKNOWLEDGMENT

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The main host of Carapus acus in temperate waters of the Mediterranean  
Sea and northeastern Atlantic Ocean SPC Beche-de-mer Information  
Bulletin **34** – May 2014.

**DIVERSITY, DISTRIBUTION AND SPECIES COMPOSITION OF  
ODONATA AND THEIR ASSOCIATION TO HABITAT VARIABLES IN  
OMASSERI, KOZHIKODE DISTRICT**

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**ABSTRACT**

Odonates are biological indicators and relatively little information is available on their environmental associations. Therefore an attempt is made to study diversity, abundance, habitat preference, seasonal variation and impact of environmental factors on Odonate distribution in Omasseri, Mukkom, Kozhikode District in Kerala. Standardized survey method for Odonates involved periodical counts over selected study site was adopted. Habitat variables such as air temperature, water temperature, pH, humidity, light intensity were studied and analysed through a multivariate approach. A total of 24 species representing 19 genera from 8 families were collected and recorded. Libellulidae was the dominant family with 8 species (33.33%) followed by Coenagrionidae (6), Calopterygidae (2) Lestidae (2) Platicnemididae (2) Chlorophidae (2) protoneuridae (1) euphidae (1). Total of 848 individuals from 24 species were collected and *Neurothemis tulia* is the most abundant with 243 individuals (28.65%) followed by *Corpora marginipes* (n=49) with 5.77% and *Agriocnemis pieris* (n= 46) with 5.42%. The percentage composition of males and females considerably varied in their occurrence with 58.84% and 41.16% respectively. The distribution pattern of Odonates clearly indicated the seasonal variation and has a strong preference towards monsoon season with 35%. The impact of air temperature, water temperature and humidity is negligible while the light intensity directly correlated the distribution and abundance of Odonates.

**Key words:** - Odonata, Abundance, Habitat preference, Seasonal Variation, Environmental association.

**INTRODUCTION**

Biodiversity conservation and management are worldwide concern [Ramesh et al, 2010]. Odonates were the first insect group that has been globally assessed (Clausnitzer *et al*, 2009). Studies on Odonates have been extensively carried out in India (Fraser, 1933, 1934, 1936; Subramanian, 2005; Emiliyamma, 2010 & 2012, Kandibane et al., 2003). Globally 5,740 species of odonates are known of this 470 species in 139n genera and 19 families exist in India [Subramanian, 2009]. They are valuable as indicators of aquatic and terrestrial ecosystem health [Brown, 1991, Samways & Steyler, 1996, Chovanec & Waringer, 2001, Smith et al, 2007, Silva et al, 2010) and also play a vital role as prey and predator to maintain the balance of tropic levels of food chain. They are also an important and widespread component of freshwater ecosystems, being top predators [Corbet, 1999]. The study on their distribution and association with environmental factors is scanty. Odonate occupy almost all kinds of habitats along the habitat permanent gradient ranging from permanent running waters and lakes to small temporary rain pools [Corbet, 1999]. In the present study we tried to explore species diversity, abundance and distribution of odonates and their association towards different ecological variables.

## MATERIALS AND METHODS

The study area is situated 4km away from Mukkom town of Kozhikode district in Kerala extended over an area of 2 acre . The area covered paddy fields and streams that flowing into Manipuram puzha. The sampling was carried out from Nov. 2013 to June 2014. Different aspects of Odonates distribution were intensively monitored. Odonate species were observed visually and sample collections made with insect catching nets and also by hand picking. The collections were done between 9am - 5pm. Common species were identified, counted & photographed in the field. Collected and photographed species were identified with the help of standard pictorial guides (Subramanian, 2005, Emiliyamma et.al, 2005, Kiran, 2013).

## RESULTS AND DISCUSSIONS

A total of 24 species representing 19 genera from 8 families were recorded (Table-1). Libellulidae was the dominant family with 8 species (34%) followed by Coenagrionidae(6), Calopterigidae(2), Lestidae (2), Platicnemididae (2), Chlorophidae (2), protoneuridae (1), euphidae (1)- Fig.1

*Neurothemis tulia* was most abundant species with 243 individuals (28.65%) followed by *Corpora marginipes* (n=49, 5.77%) and *Agriocnemis pieris* (n= 46) with 5.42%. The species such as *Ishnura aurora*, *Lestes umbrinus*, *Tholymis tillagra* and *Pseudagrion indicum* have recorded in least frequency while *Eupheae dispar* was observed only once with one individual. 16 species were damselflies while dragonflies composed of 8 species (66.66%) revealed that the habitat structure clearly support damselflies. Variation in the number of males and females in their occurrence was prominent. The total percentage of males recorded was 58.84% to that of 41.16% of females (Fig.2). No females were recorded from *Vestalis gracilis*, *Ishnura aurora*, *Lestes praemorsus*, *Orthetrum chrysis*, *Orthetrum pruinosum*, *Euphea dispar* and *Pseudagrion indicum*.

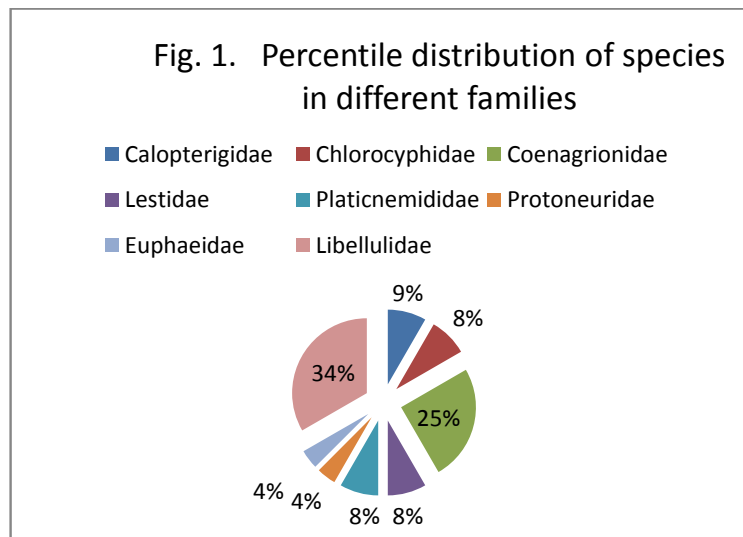
The abundance of Libellulidae (Anisoptera) and Coenagrionidae (Zygoptera) in the area might be due to their shorter life cycle and widespread distribution (Norma Rashid et al, 2001) and tolerant to wide range of habitats (Gentry et al, 1975; Samways 1989). The abundance could be attributed to the presence of shade over the habitat from the trees present around the water bodies and presence of aquatic vegetation. Fraser (1933) and Subramanian (2005) revealed that the shade and aquatic vegetation could favour Zygoptera more than Anisoptera. Among Zygopterance *Corpora marginipes* was most dominant species which accounted for 17.5% of total Zygopterans.

**Table. 1- List of odonates Recorded.**

S. No	Sub order	Family	Scientific name	Common name
1.	Zygoptera	Calopterigidae	<i>Vestalis gracilis</i> (Rambur, 1842)	Clear Winged Flash wing
2.	Zygoptera	Calopterigidae	<i>Vestalis apicalys</i> (Selys 1873 )	Black Tipped Wing
3.	Zygoptera	Chlorocyphidae	<i>Rhinocepha bisignata</i> Hagen in Selys,1853	Stream Ruby
4.	Zygoptera	Chlorocyphidae	<i>Libellago lineate</i> (burmeister, 1835)	Indian Yellow Lined Gem
5.	Zygoptera	Coenagrionidae	<i>Agriocnemis pieris</i> Laidlaw 1919	White Wasp
6.	Zygoptera	Coenagrionidae	<i>Archibasis oscillans</i> (Selys ,1877)	Blue Banded Longtail

7.	Zygoptera	Coenagrionidae	<i>Ceriagrion cerinorubellum</i> (Brauer,1865)	Painted Waxtail
8.	Zygoptera	Coenagrionidae	<i>Ischnura aurora</i> ((Brauer,1865	Golden Dartlet
9.	Zygoptera	Coenagrionidae	<i>Montagrion varralli</i> Fraser,1920	Brown Dartlet
10.	Zygoptera	Coenagrionidae	<i>Pseudagrion indicum</i> (Fraser,1924	Yellow Striped Grass Dart
11.	Zygoptera	Lestidae	<i>Lestes praemorsus</i> Hagen in selys1862	Saphphire Eyed Spreadwing
12.	Zygoptera	Lestidae	<i>Lestes umbrinus</i> Selys,1891	Brown Spreadwing
13.	Zygoptera	Platicnemididae	<i>Corpora marginipes</i> (Rambur ,1842)	Yellow Feather Leg
14.	Zygoptera	Platicnemididae	<i>Corpora vittata</i> Selys 1863	Variable Feathr Leg
15.	Zygoptera	Protoneuridae	<i>Prodasineura verticalys</i> (Selys 1860)	Red Stripped threadtail
16.	Zygoptera	Euphaeidae	<i>Euphae Dispar</i> (Rambur,1842)	Nilgiri Torrent Dart
17.	Anisoptera	Libellulidae	<i>Diplocodes trivialis</i> (Rambur ,1842)	Ground Skimmer
18.	Anisoptera	Libellulidae	<i>Neurothemis fulvia</i> (Drury ,1773)	Clear Tip Widow
19.	Anisoptera	Libellulidae	<i>Neurothemis tulia</i> (Drury ,1773)	Pied Paddy Skimmer
20.	Anisoptera	Libellulidae	<i>Orthetrum chrysis</i> (Selys 1891)	Red Faced Skimmer
21.	Anisoptera	Libellulidae	<i>Orthetrum pruinosum</i> (Burmeister 1839)	Pink Skimmer
22.	Anisoptera	Libellulidae	<i>Rhyothemis variegata</i> (Linnaeus,1763)	Common Picture Wing
23.	Anisoptera	Libellulidae	<i>Tholymis tillagra</i> (Fabricius 1798)	Evening Skimmer
24.	Anisoptera	Libellulidae	<i>Trithemis festiva</i> (Rambur 1842)	Black Stream Glider

Odonate species prefer various habitat and mode of distribution. Most of them preferred wet leaves besides the stream particularly order Zygoptera. Anisopteran species preferred small bushes near the stream. The preference towards a specific type of habitat is directly connected to their breeding habits (Aboli & Subramanian, 2013). Eight species (33.33%) of odonates were observed in a group or gregarious nature and remaining 16 species (66.66%) showed random appearance (Table.2). The aggregated distribution indicated the preference where random distribution indicates the available resource use and suitability to survival (Sunit et al, 2012). *Vestalis gracilis*, *Vestalis apicalis* and *Rhinocypha bisignata* were observed from where canopy cover is greater than 50%. It is evident that there is strong habitat and land use association in species richness which is responsible for shaping the odonate community.



## SEASONAL DISTRIBUTION

The observations clearly indicated that a strong preference towards monsoon season with 35%. Their preference during winter and summer months was 26% each. Minimum preference was during Post monsoon months. The availability of pure water bodies might be one the reasons for their assemblage during rainy months. The percentage of occurrence during summer months was only 25%. Their preference focused on that the odonate assemblage and abundance is highly dependable on availability of water bodies, shade and wet surroundings since they are highly sensitive and biological indicators.

The species such as *Agriocnemis pieris*, *c.cerenorubellum*, *Montagrion varralli*, *Corpora marginipes*, *Corpora Vittata*, *Lestes umbrinus*, *Prodasineura verticalys*, *Neurothemis fulvia*, *Orthetrum chrysis*, *Orthetrum pruinosum*, *Neurothemis tullia*, *Archibasis oscillans* were observed throughout the all seasons with maximum occurrence was during May and June months.

The abundance of *Neurothemis tullia* was almost remains high throughout the sampling period and very common in the winter season which comprised 66.7% of the total species. Most of the species were abundant in monsoon season and while *Euphaeae dispar* recorded only once in the monsoon season. 21 species with 186 individuals were found in monsoon season and less number of species was recorded during Post monsoon months with 13 species. The occurrence of species during winter and summer months was 16 species each. High occurrence of odonates during summer months probably due to availability of high rain falls during summer months in the period of study.

It is clearly indicated that the activity profile of the species depends on light variation in the area. Maximum species were observed during morning hours (9 am to 11 am) accounted 51.47% followed by afternoon hours (12 to 2pm) with 36.68%. The activity profile and their occurrence were low during evening hours (5 to 6pm) and it was also confirmed by recording the light intensity recorded from the area. Maximum species was recorded when the light intensity in between 1000-1500lux while minimum occurrence was noticed when the light was in between 500-600lux. The temperature and light was ideal during morning hours favoured the abundance of odonates since they are light loving creatures. The number was gradually decreased towards evening hours.

**Table.2. Habitat Preference and Species Distribution**

Species	Habitat	Mode of distribution
<i>Vestalis gracilis</i>	Vegetation in stream	Aggregated
<i>Vestalis apicalys</i>	Wet leaves besides streams	Aggregated
<i>Liballago lineatae</i>	Mainly on submerged rocks	Random
<i>Agriocnemis pieris</i>	On grasses	Aggregated
<i>Ceriagrioncerinorubellum</i>	Vegetation besides stream	Random
<i>Iscnura aurora</i>	Vegetation besides stream	Random
<i>Montagrion varralli</i>	On grasses	Aggregated
<i>Lestes praemorsus</i>	Wet plants and leaves besides stream	Random
<i>Lestes umbrinus</i>	Wet plants and leaves besides stream	Random
<i>Corpora marginipes</i>	Wet plants and leaves besides stream	Aggregated
<i>Corpera vittata</i>	Wet plants and leaves besides stream	Aggregated
<i>Prodasineura verticalys</i>	Vegetation besides stream	Random
<i>Rhinocephnata bisignata</i>	Submerged logs and vegetation	Random

<i>Archibasis oscillan</i>	Vegetation besides stream	Aggregated
<i>Pseudagrion indicum</i>	Vegetation besides stream	Random
<i>Diplocodes trivialis</i>	On rocks besides stream	Random
<i>Neurothemis fulvia</i>	On small bushes	Random
<i>Neurothemis tulia</i>	On small bushes	Aggregated
<i>Orthetrum chrysis</i>	On small bushes	Random
<i>Orthetrum pruinosum</i>	On small bushes	Random
<i>Rhyothemis variegata</i>	On small bushes	Random
<i>Tholymis tillagra</i>	On small bushes	Random
<i>Trithemis aurora</i>	On small bushes	Random

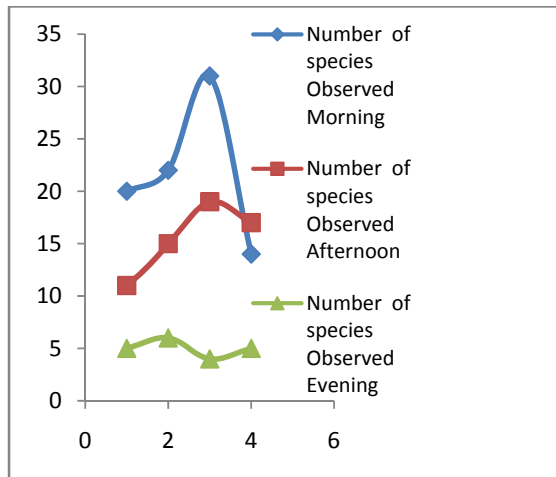


Fig.3. Variation in the frequency of odonates observed in different time of observation

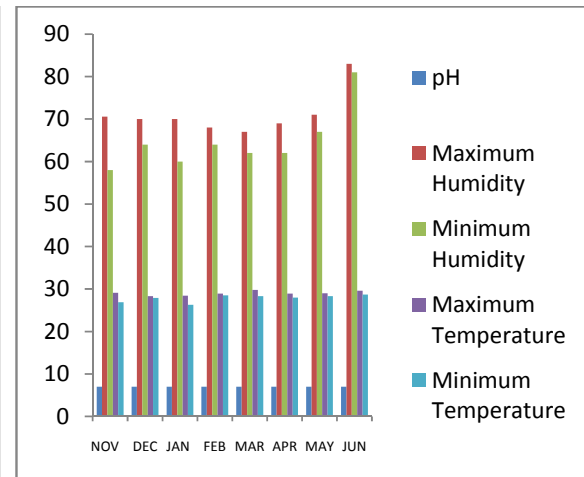


Fig.4. Monthly variation ecological variables in the study area

Monthly wise analysis of water temperature, pH, atmospheric temperature and humidity shows that there were no considerable variations. The analysis of acidity, alkalinity, chlorine, calcium, sulphates, ammonia, TDS of water samples indicated that the value was in the permissible limit except the iron content indicated that no significant pollution and sewage disposal in the area. *Brachythemis contaminata* is a dragonfly of polluted water seen abundantly where sewage disposal is high was not recorded from the area. There was no marked difference in the water and air temperatures in different month in the study area. The temperature was recorded in between 27° C to 28° C revealed that the water and air temperature not imparting a considerable impact on the seasonal distribution on odonates. Studies on odonates in the Kadalundy estuary showed (Abdul et al, 2013) that air temperature and soil temperature has a significant effect on the distribution and abundance of Odonates. Study of odonates becomes important in order to understand the ecosystem health. In wetland habitat the odonates function as efficient indicators of environment health. In agro-ecosystems they are important bio-control agents helping in controlling insect pest population. However, odonates and their habitats are under threat due to large scale habitat fragmentation and loss, irreversible damage to their breeding habitats by draining of the swamps, habitat alterations, pollution and eutrophication of the water bodies.





*Vestalis apicalis*



*Archibasis oscillans*



*Neurothemis tulia*



*Trithemis aurora*



*Rhincocypha bisignata*



*Libellago lineta*

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